

PROJECT SPECIFICATIONS

NEW WENTWORTH HALL

273 WASHINGTON STREET

WESTWOOD, MA

June 10, 2020

BID # ECON-21-B-01

OWNER:

Town of Westwood, MA

OWNER

REPRESENTATIVE:

Arcadis

ARCHITECT:

McKay Architects

STRUCTURAL

ENGINEER:

Goldstein / Milano

M-E-P-FP

CONSULTANT:

South Shore
Construction
Consultants

CIVIL

ENGINEER

GCG Associates

SECTION 00 01 07
SEALS PAGE

McKay Architects
35 Bryant Street
Dedham, MA 02026
(781)326-5400

Project Name: New Wentworth Hall

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Michael McKay

Date

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SECTION 00 11 13

INVITATION TO BID

THE OWNER (HEREINAFTER REFERRED TO AS OWNER OR AWARDING AUTHORITY):

Town of Westwood
580 High Street
Westwood, MA 02090

THE OWNER'S PROJECT MANAGER (HEREINAFTER REFERRED TO AS OWNER'S PROJECT MANAGER OR OPM)

Arcadis, U.S., Inc.
30 Braintree Hill
Braintree, MA 02184

AND THE ARCHITECT (HEREINAFTER REFERRED TO AS ARCHITECT):

McKay Architects
35 Bryant Street
Dedham, MA 02026

FOR:

New Wentworth Hall
280 Washington Street
Westwood, MA 02090

1.01 TO: ALL BIDDERS

- A. The Town of Westwood, the Awarding Authority, invites sealed bids from General Bidders and Filed Sub-Bidders for construction of a new Wentworth Hall Library across the street from its existing location at 280 Washington Street, Westwood, MA.
- B. Bidding, selection procedures and contract awards shall be in conformity with applicable statutes of the Commonwealth of Massachusetts. State mandated prevailing wage rates must be paid in accordance with M.G.L. Chapter 149, Sections 26 to 27D inclusive.

1.02 PROJECT DESCRIPTION:

- A. The Proposed Westwood Wentworth Hall Library will be located across the street from the existing branch at 280 Washington Street. The proposed design includes construction of a new wood framed library facility of approximately 8,135 sf. The first floor contains the major library spaces and functions, while the lower floor contains a conference / community meeting room, and office space for other Town departments including Youth and Family Services.
- B. The proposed design will relocate portions of the existing library facades, for use in the new library. The demolition, preparation, and relocation of these facades **will be included** as part of this contract. Please note, the new foundation, including damp proofing/protection board, and backfill (to elevations noted) for the library has been designed and constructed under a separate contract. Access to the existing CVS parking lot must always be available during construction. Site improvements will include the excavation, preparation, and installation of underground utilities, as well as new site paving, parking, roadways, plantings, and other site improvements as indicated in the contract documents.
- C. The estimated project construction cost is approximately \$2,686,500 with a schedule of 9 months.

1.03 DOCUMENT AVAILABILITY

- A. Hard copies of the Bid Documents may be obtained by eligible bidders from:
- Needham Reprographics
163 Reservoir Street
Needham, MA 02494
(781) 559-3035
1. A refundable Bid Document deposit of \$200.00 (maximum two sets) per each set of drawings and specifications shall be paid in the form of a certified or cashier's check made payable to the Town of Westwood.
 2. Bid Document Deposits are 100% refundable for up to two sets for General Contractors and one set for sub-bidders upon return of documents in good condition to the printer identified herein within 14 calendar days after the opening of bids. Failure to return bid documents within the allotted time frame will result in forfeiture of deposit.
 - a. Eligible Bidders seeking additional sets of bid documents shall pay all associated printing and mailing costs directly to the printer.
- B. Bidding documents will also be made available online at:
<https://www.townhall.westwood.ma.us/departments/procurement>, click on the link to "Procurement Requests" located on the left side. Drawings and Specifications will be available to download.
- C. Upon receipt of Bid Documents verify that documents are complete. Notify the Owner's Project Manager or Architect should the documents be incomplete.
- D. Immediately notify Owner's Project Manager or Architect upon finding discrepancies or omissions in the Bid Documents.
- E. The contract documents consist of printed (hard copy) drawings and specifications published and issued by the awarding authority identified above. Contractors that obtain electronic or printed copies of bid documents through any means other than the method identified (including third party plan rooms), or partial or incomplete bid documents are at risk for any incorrect assumptions or interpretations based upon differences between obtained electronic documents and the paper documents issued by the awarding authority.
- F. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

1.04 DOCUMENT INSPECTION

- A. A copy of the Bid Documents and instructions may be examined at the following address:
- Westwood Town Hall
580 High Street
Westwood, MA 02090
- B. Examination and inspection of the bid documents will be available by appointment only. Due to COVID-19, Town Hall hours of operation are changing and being updated frequently. Those seeking inspection of the documents are required to contact Arcadis, the Owner's Project Manager, to set up an appointment:
- Steven Brown
Arcadis, U.S., Inc.
30 Braintree Hill
Braintree, MA 02184
Steven.w.brown@arcadis.com
(617) 849-9401

1.05 PRE-BID CONFERENCE

- A. A non-mandatory pre-bid conference has been scheduled for 10:00 AM on Wednesday, the 8th day of July, 2020 at the project site, across the street from 280 Washington Street, Westwood, MA02090.
- B. All Filed Sub-Bids, Non-Filed Sub-Bids, General Bidders, and suppliers are invited to attend.
- C. Representatives of the Architect and OPM will be in attendance.
- D. Requests for interpretation of plans and specifications may be submitted in writing at that time.
- E. Bidders will have an opportunity to view the site of the work following the Pre-bid Conference.
- F. Discussions at the conference will not form or become a part of the Contract. Any revisions to the documents resulting from questions raised or discussions at the meeting will be incorporated by Addendum.
- G. Information relevant to the Bid Documents will be recorded in an Addendum, which will be issued to Bid Document recipients.

1.06 BID REQUIREMENTS

- A. Bidders shall refer to all Division 00 and Division 01 specification sections, and specifically the following sections which provide requirements related to the submission of bids and information about the project that will affect bids:
 - 1. Section 01 10 00 - Summary: description of Phasing, Wage requirements, OSHA requirements, and other administrative requirements.
 - 2. Section 00 21 13 - Instructions to Bidders: specific instructions regarding the submission of bids.

1.07 FILED SUB-BID SUBMISSION

- A. The Town of Westwood will receive sealed Filed Sub-Bids for the listed sub-trades until 11:00 AM Verizon time, Thursday, July 23, 2020, at the following address:
 - Town of Westwood
 - c/o Procurement Department Office
 - Westwood Town Hall - 2nd Floor
 - 580 High Street
 - Westwood, MA 02090
- B. Submit Bids on the Form for Filed Sub-Bid provided in this manual.
- C. Additional documents are required to be included with the Filed Sub-Bid Form - refer to Section 00 21 13 Instructions To Bidders.
- D. Time shall be local, as reported by cellular phone provider.
- E. If mailed, Filed Sub-Bids should be sent to the address above and received no later than the time specified above.
- F. Filed Sub-Bids will be publicly opened immediately following the due date and time. at the Selectmen Conference Room at Westwood Town Hall, read aloud, and recorded for presentation to the Awarding Authority.
- G. Refer to Section 00 21 13 "Instructions to Bidders" for specific submission requirements related to Filed Sub-Bids.
- H. No Filed Sub-Bid may be withdrawn prior to the expiration of the statutory period after the opening of General Bids for the making of awards and completion of the process of entering into contracts.
 - 1. All Filed Sub-Bids submitted shall be considered valid for a period of not less than 60 days from the due date for General Bids. See BID ACCEPTANCE / REJECTION paragraphs below.

1.08 FILED SUB-BID CATEGORIES

1. Filed Sub-Bids are eligible to submit bids for the following trades in accordance with M.G.L. Chapter 149, which are described by the specification sections indicated: Masonry - Section 04 00 01
2. Roofing, Flashing, and Sheet Metal – Section 07 00 02
3. Tile – Section 09 00 02
4. Acoustical Ceilings – Section 09 00 03
5. Resilient Flooring – Section 09 00 05
6. Painting – Section 09 00 07
7. Elevators – Section 14 00 01
8. Fire Protection - Section 21 00 01
9. HVAC – Section 23 00 01
10. Electrical – Section 26 00 01

1.09 GENERAL BID SUBMISSION

- A. The Town of Westwood will receive and open sealed General Contractor Bids until 11:00 AM Verizon time, Thursday, July 30, 2020, at the following address:
 1. Town of Westwood
 2. c/o Procurement Department Office
 3. Westwood Town Hall - 2nd Floor
 4. 580 High Street
 5. Westwood, MA 02090
- B. Submit Bids on the Form for General Bid provided in this manual.
- C. Additional documents are required to be included with the Form for General Bid - refer to Section 00 21 13 Instructions To Bidders.
- D. Time shall be local, as reported by cellular phone provider.
- E. If mailed, General Bids should be sent to the address above and received no later than the time specified above.
- F. General bids will be publicly opened immediately following the deadline for General Bid Submission. at the Selectmen Conference Room at Westwood Town Hall, read aloud, and recorded for presentation to the Awarding Authority.
- G. Refer to Section 00 21 13 "Instructions to Bidders" for specific submission requirements related to General Bids.
- H. No bid may be withdrawn prior to the expiration of the statutory period after the opening of General Bids for the making of awards and completion of the process of entering into contracts. Refer also to CONTRACT AWARD below.
- I. All General Bids submitted shall be considered valid for a period of not less than 60 days from the due date for General Bids. See BID ACCEPTANCE / REJECTION paragraphs below.

1.10 BID ACCEPTANCE / REJECTION

- A. The Awarding Authority reserves the right to waive any informality in or to reject any or all General Bids or Filed Sub-Bids if it determines that it is in the public interest to do so.
- B. The Awarding Authority reserves the right to reject any or all General Bids or Filed Sub-Bids if it determines that such Sub-Bid does not represent the Sub-Bid of a person competent to perform the work as specified, or if less than three such sub-bids are received and the prices are not reasonable for acceptance without further competition.
- C. The Awarding Authority shall reject every bid which is not accompanied by a bid deposit as prescribed in Section 44A of Chapter 149 of the General Laws, or which otherwise does not conform with Sections 44A-F, inclusive, of

said chapter, 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 Awarding Authority to reject such a sub-bid within such period shall not validate such a bid nor preclude the Awarding Authority from subsequently rejecting it.

- D. If a Contract is to be awarded, it will be to the lowest responsible and eligible Bidder for the Base Bid and Alternates selected, except in the event of substitution as provided under M.G.L. Chapter 149, Sections 44E and 44F, in which cases the procedures required by said Sections shall govern the award of the Contract.
- E. The term "lowest responsible and eligible bidder" as used herein shall mean the Bidder whose bid is the lowest of those Bidders demonstrably possessing the skill, ability, and integrity necessary for the faithful performance of the work, and who meets the requirements for Bidders set forth in M.G.L. Chapter 149, Sections 44A - 44F and not debarred from bidding under M.G.L. Chapter 149, Section 44C; and who shall certify that they are able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.
- F. If the Contract is to be awarded, the General Contractor will give the Successful Sub-Bidder a Notice of Award within sixty days (Saturdays, Sundays, and legal holidays excluded) after the date of the general bid opening.
- G. The Awarding Authority encourages prospective bidders to employ qualified local labor should the bidders be awarded work pursuant to the bid procedure.
- H. The Awarding Authority is requiring all Contractors follow the Commonwealth's "COVID-19 guidelines and procedures for all construction sites and workers at all public work." The full guidelines and procedures are available at the following address: <https://www.mass.gov/covid-19-guidelines-and-procedures-for-all-construction-sites-and-workers-at-all-public-work>, including additional supplemental guidelines.

END OF INVITATION TO BID

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS

1.01 GENERAL

- A. The Invitation for Bids is hereby made a part of this contract.
- B. The attention of bidders is called to those parts of the Legal/Contractual Documents regarding labor conditions, wage rates, etc.
- C. All bids for this project are subject to the provisions of Massachusetts General Law, Chapter 149, Sections 44A through 44F (inclusive), as most recently amended.

1.02 CONTRACT DOCUMENTS IDENTIFICATION

- A. The Contract Documents are as prepared by McKay Architects, Inc. who are located at 35 Bryant Street, Dedham, MA 02026, and with contents as identified in the Table of Contents and List of Drawings.

1.03 BIDDER INQUIRIES/ADDENDA

- A. Bidders shall promptly notify the Architect of any ambiguity or inconsistency which they may discover upon examination of the Contract Documents, the site, and local conditions.
- B. Any questions regarding the intent or meaning of the drawings or specifications shall be submitted in writing via email by the bidders to the Architect prior to 1:00 pm at least four (4) business days before the advertised openings of the bids.
 - 1. Verbal inquiries will be rejected, and any verbal responses to inquiries are not binding on any party.
- C. Direct all questions and inquiries to the Architect at the following contact:
 - 1. Mike McKay
 - 2. Telephone: (781) 326-5400 (All inquiries regarding the content of the drawings or specifications that affect all bidders shall be in written form) – no verbal responses will be provided.
 - 3. Email: mike@mckayarchitects.net
- D. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.

1.04 ADDENDA

- A. The Architect shall arrange as addenda, which shall become a part of the contract and specifications, all questions so received with his decision regarding each, and he shall send a copy of these addenda to the bidders who are on record as having received drawings and specifications from the printer identified in the Invitation for Bids, at least three business days prior to advertised opening of Sub Bids.
- B. Neither the Owner nor the Architect is responsible for timely delivery of these addenda, and Bidders and Sub-Bidders alike must satisfy themselves that they have obtained all addenda.
- C. Copies of addenda will be made available for inspection at the location listed in Section 00 11 13 - Invitation for Bids where Bid Documents are on file.

1.05 EXISTING CONDITIONS

- A. All bidders are required to examine the project site and conditions before submitting a bid.
- B. Prior to bidding, the Contractor, at his expense and with permission of the Owner, may make his own subsurface investigations to satisfy himself with the site and subsurface conditions.
- C. Bidders are required to submit their proposals upon the following express conditions, which shall apply to and become part of every bid received:

1. Bidders must satisfy themselves by personal examination of the location of the proposed work and by such other means, as they may desire, as to actual conditions and requirements of the work.
2. No consideration will be granted for any alleged misunderstanding of the material, article, or piece of equipment to be furnished or work to be done; it being understood that the tender of Bid proposal carries with it the agreement to all items and conditions referred to herein or indicated in the contract documents.

1.06 BID SUBMISSION

- A. General Bidders and Filed Sub-Bids shall submit bids using the forms contained in this Project Manual. Refer to Section 00 41 12 and Section 00 41 13 for Form for General Bid and Form for Filed Sub-Bid, respectively.
- B. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed. Refer to the Section 00 11 13 INVITATION TO BID.
- C. Submit one copy of the executed Bid on the Bid Forms provided, signed, and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.
- D. Provide bid documents without any binders, folders, plastic coverings, or other non-paper items. Binder clips or staples are permitted. Binder clips are preferred.
- E. Improperly completed information, irregularities in bid bond security, may be cause not to open the Bid Form envelope and declare the bid invalid or informal.
- F. Bids may be withdrawn at any time prior to the designated time for the opening of bids.
 1. No bids may be withdrawn prior to the expiration of the statutory period after the opening of General Bids for the making of awards and completion of the process of entering into contracts.
 2. No Filed Sub-Bid may be withdrawn prior to the expiration of the statutory period after the advertised opening of the Sub- Bids for the making of awards and completion of the process of entering into contracts.

1.07 FILED SUB-BIDS

- A. Filed Sub-Bids shall be required for the categories list in the Invitation to Bid in accordance with M.G.L. Chapter 149, which are described by the Specification Sections indicated in the Invitation to Bid.
- B. If a General Bidder customarily performs with his own employees any sub-trade or trades listed in Item 2 of the proposal form, he may submit his name and an amount for such work as a Sub-Bid on the form herein required of the regular sub-bidders, and he shall also submit his name and amount for such work in his own bid for general work under Item 2. Such submission by selected Contractor shall be considered on a par with Sub-Bids filed with the Owner by Sub-Bidders who customarily perform such work. No such Sub-Bids by a Contractor shall be considered, however, unless he can show to satisfaction of the Owner that he does customarily perform such work and is qualified to do the character of the specified sub-trade work as required by the specifications.
- C. Filed Sub-Bid's Obligation to Furnish a Payment Bond and a Performance Bond.
 1. Since General Bidders and Filed Sub-Bids applies to this Project, the Filed Sub-Bids who are awarded subcontracts shall be required to provide a performance bond and a payment bond to the General Contractor. Filed Sub-Bids are advised that they shall include in the Sub-Bid price the cost of furnishing a performance bond and a payment bond to the General Contractor.
 2. Unless expressly waived by the Owner, all subcontractors employed on the project for any scope of work exceeding \$100,000 shall be obligated to provide a 100% performance and payment bond, from a Surety who is listed on the current U.S. Treasury List of acceptable sureties, naming the Owner as an additional Obligee under the bond.

1.08 BID INELIGIBILITY

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.
- B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Owner, be declared unacceptable.

1.09 BID ENCLOSURES

A. BID SECURITY

1. Each General Bidder and each Filed Sub-Bid must be accompanied by a Bid Bond for not less than five percent (5 percent) of the bid price in one of the following forms:
 - a. In the form set forth herein or AIA Bid Bond form A310, or a form issued by a surety company containing comparable language and furnished with bid forms and issued by a surety licensed to do business in the Commonwealth of Massachusetts by the Division of Insurance and conditioned upon faithful performance by the principal of the agreements contained in the bid),
 - 1) Endorse the Bid Bond in the name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.
 - 2) In cash
 - 3) By a certified check, drawn on a national bank or trust company, payable to Town of Westwood, said security to be returned to the bidder unless forfeited under the conditions herein stipulated.
2. The security shall be enclosed in the sealed envelope containing the bid.
3. The security will be returned after delivery to the Owner of the required Contract with the Performance and Payment Bond(s) by the accepted bidder.
4. Include the cost of bid security in the Bid Amount.
5. Bid deposits of the three (3) lowest responsible and eligible Filed Sub-Bids for each Filed Sub-Bid category shall be retained until the execution and delivery of a Filed Sub-Bid Contract.
6. If all sub-bids are rejected in a Filed Sub-Bid category, all bid securities received in that sub-bid category will be returned forthwith.
7. If a selected Filed Sub-Bid fails to perform his agreement to execute a Subcontract with the General Contractor, and fails to furnish a Performance and Payment Bond as stated in his Sub-Bid, the bid deposit of such Filed Sub-Bid shall become and be the property of the Owner as liquidated damages.

B. DCAM CERTIFICATE OF ELIGIBILITY & UPDATE STATEMENT:

1. Each General Bid and each Filed Sub-Bid must be accompanied by a current DCAM Certificate of Eligibility. Bids that are received without certificates will be rejected.
2. Each General Bid and each Filed Sub-Bid must be accompanied by a current DCAM Update Statement, Form CQ-3. Bids that are received without completed update statements will be rejected.
3. The DCAM Certificate of Eligibility and the Contractor Update Statement are not public records as defined in M.G.L., Chapter 4, Section 7 and will not be open to public inspection. These forms should be submitted in a separate sealed envelope, placed within the sealed envelope containing the bid and other required forms.

C. BIDDER'S CERTIFICATE OF NON-COLLUSION

1. Each General and Filed Sub-Bid must be accompanied by a completed Certificate of Payment of Prevailing Wages.

D. LIST OF UNIT PRICES

1. Each General Bid and Filed Sub-Bid must be accompanied by a completed list of Unit Prices applicable to that bidder's scope of work, based on the schedule in Section 00 43 01.03 – UNIT PRICES FORM.
 - a. If Unit Prices listed do not affect the Filed Sub-Bidder's scope of work, indicate "N/A" for that unit price.
 - b. Failure by a Filed Sub-Bidder to include a completed list of Unit Prices with the bid shall signify that the Filed Sub Bidder is confirming that there are no costs related to any of the Unit Price descriptions listed on the form.

SECTION 00 21 13 3

1.10 BID FORM SIGNATURE

- A. The Bid Form shall be signed by the bidder, as follows:
 - 1. Sole Proprietorship: Signature of sole proprietor.
 - 2. Partnership: Signature of authorized partners. Insert the word "Partner" under each signature. Affix seal to each signature.
 - 3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.
 - 4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

1.11 FORMS REQUIRED AT CONTRACT EXECUTION

- A. Insurance certificates for General Contractor and Filed Sub-Bid Contractors.
- B. Form of Sub-Contract executed and submitted for Filed Sub-Bid Contractors.
- C. Statement of Management on Internal Accounting Controls and a Statement prepared by a CPA expressing an opinion to the state of Management Controls, as required by M.G.L. Chapter 30, Section 39R.
 - 1. For Subcontracts and purchase orders with a value of \$100,000 or more.
- D. Certificate of Tax Compliance
- E. Certificate of Authority (if successful bidder is a corporation).
- F. Bonds: Performance Bond and Labor and Materials Bonds
 - 1. A Performance Bond and a Labor and Material Payment Bond, each in the sum of the full amount of the bid, shall be furnished by the General Contractor to the Awarding Authority on the forms set forth herein from a surety company licensed to do business in the Commonwealth of Massachusetts and satisfactory to the Awarding Authority.
 - 2. In case the party to whom the contract is awarded shall fail or neglect to execute the contract and furnish satisfactory bonds within the time specified, the Awarding Authority may determine that the Bidder has abandoned the contract, and the bid deposit accompanying the bid shall be forfeited to and retained by the Awarding Authority as liquidated damages for such failure and neglect, and to indemnify the Awarding Authority for any loss which may be sustained by failure of the Bidder to execute the contract and furnish bond as aforesaid.

1.12 ALTERNATES

- A. All Bidders shall include a price for each Alternate in the designated space on the Bid Form. The prices given shall be total prices and shall include all costs for bonding, insurance, overhead and profit, or any other costs. If no change in the Base Bid is required, enter "No Change". Refer to drawings and Section 01 23 00 – ALTERNATES - for description of alternate scopes.

1.13 UNIT PRICES

- A. Unit Prices shall be submitted by General Bidders and Filed Sub-Bidders for any scope of work identified at Section 00 43 22 Unit Prices Form that relate to the General Contractor's or Filed Sub-Bid Contractor's scope. If the unit price listed does not affect the Filed Sub-Bidder's scope of work, indicate "N/A." Submit prices using the form provided in the Section. Failure by Filed Sub Bidders to submit a List of Unit Prices shall represent that the Sub-Bidder is stating that all of the Unit Prices listed in Section 00 43 01.03 do NOT apply to the work of that Sub Bid.

1.14 ESTIMATING

A. If any inconsistency shall be found to exist within the Contract Documents, the greater quantity or better quality shall be assumed.

END OF SECTION

SECTION 00 31 00

AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but

Geotechnical Report: Wentworth Hall Library Expansion
273 Washington Street, Westwood, Massachusetts, dated June, 2019 By McArdle Gannon Associates.

This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing based on Unit Prices.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

GEOTECHNICAL ENGINEERING REPORT



WENTWORTH HALL LIBRARY EXPANSION

ISLINGTON VILLAGE
WASHINGTON STREET
WESTWOOD, MASSACHUSETTS

PREPARED FOR:
MCKAY ARCHITECTS, INC.
35 BRYANT STREET
DEDHAM, MA 02026

PREPARED BY:
MCARDLE GANNON ASSOCIATES, INC.
300 OAK STREET, SUITE 460
PEMBROKE, MA 02359

MGA FILE NO:
W0763

DATE:
JUNE 2019



June 3, 2019
MGA File No. W0763

Michael McKay
McKay Architects Inc.
35 Bryant Street
Dedham, MA 02026

RE: Geotechnical Engineering Report – Wentworth Hall Library Expansion – Islington Village, Washington Street, Westwood, Massachusetts

Mike:

McArdle Gannon Associates, Inc. (MGA) is pleased to present the results of our geotechnical engineering studies performed for the referenced project. The purpose of our studies was to assess subsurface conditions within the proposed building area and provide recommendations for site development as they relate to building foundation and ground floor slab support, underdrainage, and related earthwork construction considerations.

Our geotechnical engineering studies have been performed in accordance with our proposal to you dated May 9, 2019 and are subject to the Statement of Limitations attached as Appendix A.

BACKGROUND

Our understanding of the current project design is based on our discussions with you, our site visits, and a review of the following documents:

- A plan set entitled “Wentworth Hall Islington Library Expansion” by McKay Architects, dated March 14, 2019,
- A plan entitled "Existing Conditions Site Plan School Street Side," dated December 12, 2017, by GCG Associates, Inc.,
- A plan entitled “Surficial Geologic Map of the Norwood Quadrangle, Massachusetts,” by the United States Geological Survey (USGS), dated 1966, and
- A plan entitled “Bedrock Map of Massachusetts,” by the United States Geological Survey (USGS), dated 1983.

The site comprises two lots located at 277-283 and 277A Washington Street in Westwood, Massachusetts. A Site Locus is attached as Figure 1. Portions of the property are currently an active construction site. Construction of a new CVS building is underway and the previous structures on the property have been razed. A portion of the area is currently being used for public parking.

We understand the existing Wentworth Hall Islington Library will be moved from across the street and a 4,000± square foot addition added onto the western side of the building. The building footprint (existing structure and addition) will be located approximately 100± feet north of the new CVS building and will have a full basement. The proposed basement will have a finished floor at roughly Elevation 98± feet.

The site is relatively flat, with existing grades varying from about Elevation 108± to 112± feet. We anticipate that a cut up to about 10± to 14± feet will be required to reach the finished floor elevation of the basement (not including slab/footing and base course thicknesses). Deeper cuts are anticipated for the elevator.

SUBSURFACE EXPLORATIONS

We conducted a subsurface exploration program consisting of six test pits as part of our studies to gather information on the subsurface conditions within the proposed re-located building and addition footprint. The purpose of the test pits was to assess subsurface soil and groundwater conditions within the proposed building area with particular emphasis on assessing the quality and thickness of existing fill soils and depth to natural soils and bedrock.

A. DiMartino Construction (DiMartino) of Norfolk, Massachusetts excavated six test pits (TP-1 through TP-6) within the proposed building area on May 20, 2019 using a Caterpillar 315CL tracked excavator. DiMartino excavated the test pits to depths of about 2± to 10.5± feet below existing ground surface, terminating with refusal on probable bedrock at each exploration location.

MGA personnel observed the test pits, visually described the conditions encountered, prepared the logs, and located the test pits in the field by tape measurement and line of sight from the existing site features. The test pit locations are shown on the attached “Exploration Location Plan” (Figure No. 2). Ground surface elevations shown on the test pit logs and discussed in this report were interpolated from ground surface contours and spot grades shown on the referenced “Existing Conditions Site Plan School Street Side” and should be considered approximate.

Our descriptions of the subsurface conditions encountered at each test pit location are shown on the logs attached as Appendix B. Pictures of the test pits are attached as Appendix C.

LABORATORY SOIL TESTING

A laboratory soil testing program consisting of 3 wash sieve and 3 moisture content analyses was performed on selected samples of the existing fill and natural sand soils collected during the exploration phase from test pits TP-1, TP-2, and TP-4. The testing was performed to aid in classifying the soil and assess the grain size distribution of the soil, which is useful in assessing engineering design parameters and predicting soil behavior. The results of these tests are provided in Appendix D.

SUBSURFACE CONDITIONS

The subsurface profile encountered in the test pits generally consists of surficial asphalt or topsoil over $2\pm$ to $5.5\pm$ feet of existing fill soils underlain by natural sandy glacial till soils over probable bedrock. A layer of natural sand was encountered below the fill in test pit TP-2. Additional subsurface information can be found on the test pit logs attached as Appendix B.

Asphalt: A surficial $5\text{-}1/2\pm$ inch thick layer of asphalt was encountered at ground surface at test pits TP-1, TP-2, and TP-4.

Topsoil: An approximately $1\pm$ foot thick layer of topsoil was encountered at ground surface at test pit TP-3. The topsoil generally consists of dark brown, fine to medium sand with about 20 to 35 percent silt and about 15 to 20 percent roots.

Fill: Fill was encountered at each test pit location. The fill ranges from about $2\pm$ to $5.5\pm$ feet in thickness and generally consists of brown to dark brown, fine to coarse sand with about 25 to 40 percent fine/fine to coarse gravel, about 15 to 20 percent silt, and about 5 to 25 percent boulders and cobbles. In test pit TP-3, the fill contained up to about 5 percent metal and roots.

Refer to Appendix D for gradation curves of the existing fill soils collected from test pits TP-1 and TP-4.

Natural Sand: A thin layer of natural sand was encountered at about $3\pm$ feet below existing grades at test pit TP-2, corresponding to about Elevation $105.5\pm$ feet. The sand was about $4\pm$ feet thick and generally consists of beige to gray, fine to coarse sand with about 10 to 20 percent silt and up to about 10 percent fine gravel.

Refer to Appendix D for gradation curve of the natural sand soils collected from test pit TP-2.

Natural Sandy Glacial Till: Natural sandy glacial till soils were encountered below the existing fill or sand at depths between about $3.5\pm$ to $7\pm$ feet below existing grades at test pits TP-1 through TP-4, corresponding to about Elevation $101.5\pm$ to $106.5\pm$ feet. The glacial till generally consists of a gray, fine to coarse sand with about 15 to 50 percent fine to coarse gravel, about 15 to 20 percent silt, about 10 to 20 percent cobbles, and up to 15 percent boulders.

Probable Bedrock: Bucket refusal on probable bedrock was encountered at each test pit location at about 2± to 10.5± feet below existing ground surface, corresponding to about Elevation 98.5± to 108± feet.

The rock at the site shown on the referenced “Bedrock Map of Massachusetts” is described as: *Zwgr: Westwood Granite (Proterozoic Z) – Light-gray to pinkish-gray, fine- to medium-grained granite. Intrudes Zdgr.*

Groundwater: Groundwater levels for our study were recorded in the completed test pits at the times and under the conditions noted on the logs. Groundwater was not encountered during excavation of the test pits to the depths explored (2± to 10.5± feet below existing ground surface).

Groundwater was previously encountered in test borings performed in July 2018 for the new adjacent CVS building at depths of 5± to 10± feet below existing ground surface, corresponding to about Elevation 97± to 103± feet.

It should be expected that groundwater levels will fluctuate due to variations in temperature, rainfall and other factors. Therefore, groundwater levels during construction and thereafter may be different from those reported herein. During periods of heavy rainfall or snowmelt, perched water may be encountered on top or within silty soils or bedrock at varying elevations.

GEOTECHNICAL ENGINEERING CONSIDERATIONS AND RECOMMENDATIONS

One of the primary geotechnical engineering considerations impacting development of this site is the presence of apparent bedrock near and above proposed basement slab and foundation elevations within the proposed building area (basement slab at about Elevation 98± feet). Apparent bedrock was encountered at depths between about 2± to 10.5± feet below existing ground surface, corresponding to about Elevation 98.5± to 108± feet. We anticipate rock removal/blasting will be required to reach proposed basement slab and foundation grades.

In addition, due to the anticipated depth of excavation (10± to 14± feet from existing grades to basement finished floor, not including slab/footing and base course thicknesses) and the proximity of the existing adjacent property, a temporary earth support system will likely be required along portions of the perimeter of the proposed building. This system will protect adjacent property against excessive movements caused by the excavation and to control the lateral extent of excavations and the volume of excavated soil (unless temporary construction easements can be obtained).

Our recommendations addressing design and earthwork construction issues are made in the following sections as outlined below:

- Rock Blasting and Excavation
- Building Area Earthwork
- Foundations and Allowable Bearing Capacities

- Ground Floor Slab Support
- Seismic Design Criteria
- Basement Foundation Walls
- Groundwater Control, Moisture Control, and Dewatering
- Temporary Excavation Support

Rock Blasting and Excavation

Because of the shallow refusals encountered at the test pit locations, we anticipate the excavation to reach proposed basement slab and foundation grades in the building area will require rock removal. Typical earthwork equipment may be able to excavate the surface of the bedrock in some areas. In addition, mechanical removal (hoe ramming) may be possible where the bedrock is weathered or fractured. However, drilling and blasting will likely be required for cuts into competent bedrock.

Rock should be removed to the following minimum depths:

- 18 inches below all continuous footings/retaining wall footings
- 18 inches below bottom of all column footings
- 6 inches below utility inverts
- 16 inches below bottom of slab elevation

Drill holes within the building area should be logged by the driller and the geotechnical engineer and should extend no more than 2 feet below the minimum depths given above in building area. Overblast below the minimum depths given above may remain in-place provided that it is not more than 2 feet in thickness and is suitably compacted in-place with a large self-propelled vibratory drum roller. Otherwise, the overblast should be removed and replaced with compacted Structural Fill or Crushed Stone. The surface of the overblast and bedrock may need to be choked with a compacted layer of 1½ inch crushed stone if the surface is observed to be open-voided during construction. The objective is to mitigate the potential of future settlement resulting from the migration of soils in the open voids and fractures.

No blasting should be done without the geotechnical engineer's review and approval. Written permission and approval of blasting methods must be obtained from the local governing authority. The chosen blasting contractor should, before doing any blasting work, present to the geotechnical engineer or Owner's representative a written certificate of insurance showing evidence that his insurance includes coverage for blasting operations.

Blasting should be done by experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Accurate records should be maintained, noting location of each blast, time of detonation, total explosive weight in each blast, maximum explosive weight per delay in each blast hole, and designation of delay cap used in each hole.

Explosives should be stored, handled, and employed in accordance with state and local regulations, or, in the absence of such, in accordance with the provisions of the Manual of

Accident Prevention in Construction of the Associated General Contractors of America, Inc. and in accordance with applicable OSHA regulations.

A locally experienced blaster should be contracted and should be required to perform a test blast program for the site as part of his contract. The goal of the test blast program is to develop site specific ground vibration attenuation relationships in response to charge weight, blast delay and charge distance from property lines and other critical features. This test blast program will allow the contractor to develop an economic blasting program to maximize efficiency of the on-site production blasting operation while mitigating potential off-site effects.

The contractor should utilize the test blast program results to develop a plan showing allowable explosive charge weights per delay which will result in the attenuation of ground motions less than 0.5 inches per second at nearby residential structures and 2 inches per second at other nearby structures and at the nearest property lines (or other mutually accepted criteria based upon observation and experience) and below established air blast overpressure limits at the property limits. The contractor should submit a site plan showing contours of allowable explosive charge weights per delay along with backup calculations utilized in the mathematical model developed from the test blast program.

Seismic blast monitoring should be performed in accordance with State of Massachusetts and local regulations for each blast. The contractor and the owner's on-site geotechnical engineering representative should provide monitoring of the blasts and evaluate compliance with specified vibration and air blast overpressure criteria. Repair of damage caused by contractors' blasts should be the responsibility of the contractor. The contractor should be required to adjust the proposed blast program should vibration and/or air blast overpressure limits be exceeded whether or not damage is observed.

The blasting contractor should be required to develop a plan to perform pre-blast surveys of existing buildings within 250 feet of the blasting area in accordance with 527 CMR The Massachusetts State Board of Fire Prevention Regulations. This will allow the contractor to develop a record of existing conditions prior to blasting which may assist in defending blast damage claims.

The local Fire Marshall may suspend the requirement of pre-blast surveys if the blaster adheres to 527 CMR 13.09 (9), Option 1 (Scaled Distance Equations), in the design and implementation of blasting at the site. Flyrock should also be controlled especially when blasting near existing structures and property lines. This should be controlled by using appropriate charges, delays, blasting mats, etc.

Building Area Earthwork

The existing fill deposits are considered unsuitable for support of the proposed building loads due to their composition, erratic density, and potential compressibility. We anticipate that these soils will be removed during excavation to basement subgrade elevations. The existing fill may be locally thicker around existing utilities and structures (foundations, water lines, drain lines, manholes and catch basins, etc.). If encountered below subgrade elevations, existing fill soils

should be completely removed to firm natural ground (natural sand or glacial till soils or bedrock) at least 5 feet beyond the proposed building limits or within the area bounded by a one horizontal to one vertical (1H:1V) line sloping downward and outward from proposed bottom of exterior footing to firm natural ground, whichever is greater. Existing utilities, structures, foundations, and pavement should also be removed from within the proposed building area.

We anticipate that the basement subgrade will consist of bedrock based on the proposed basement finished floor elevation (about Elevation 98± feet) and the elevations of the bucket refusals encountered in the test pits (Elevation 98.5± to 108± feet). We recommend that any fill placed within the building area consist of compacted Crushed Stone meeting the minimum gradation requirements recommended in the attached Table 1. The crushed stone should be compacted to an unyielding state.

Foundation walls should be backfilled with “Free-Draining” Structural Fill or Sand and Gravel meeting the minimum gradation requirements recommended in the attached Table 1 as discussed further below in the “Basement Foundation Walls” section.

We anticipate most of the material excavated will be removed from the site. Any materials excavated that may meet gradation requirements for Free-Draining Structural Fill could be segregated and reused to backfill the foundation walls. If necessary, these soils could be stockpiled at an off-site location and brought back to the site as needed. Additional testing during construction will be necessary to assess conformance with gradation criteria.

The work described above should be observed by a qualified geotechnical engineer from this office to verify that firm natural ground has been achieved and to verify that foundation subgrades are firm, dry and stable prior to the placement of concrete.

Foundations and Allowable Bearing Capacities

Spread footings are recommended for support of the proposed building loads provided the preceding recommendations are followed under appropriate geotechnical engineering field observation. We anticipate that bedrock will be encountered above proposed bottom of foundation elevations based on the conditions encountered in the test pits.

We recommend supporting new footings on an 18 inch thick “soil cushion” consisting of compacted Crushed Stone where rock is encountered at or above design grades.

Overblast below footing subgrade levels can remain in-place provided it is less than 2 feet in thickness and treated as previously discussed in “Rock Blasting and Excavation.” Boulders that are encountered during footing excavations should be removed and the resulting voids should be replaced with compacted Crushed Stone.

Exterior footings and those located in unheated areas should be located at least 4 feet below finish grade for frost protection. Footings should be backfilled as soon as practical after the concrete has cured in an effort to protect the subgrades upon which they bear. Care should be

taken not to nest cobbles/boulders up against the footings, walls and utility structures during backfilling. Oversize cobbles and boulders should be removed prior to backfilling.

If winter construction is anticipated, attention should be paid to protecting foundation subgrade soils from freezing. This protection should not only be implemented before footings are poured but after as well. During cold weather, do not excavate to full indicated depth unless footings or slabs can be poured immediately after the excavation is finished. Protect footings and slabs from frost penetration into the soils upon which they rest. Insulating blankets should be spread upon the subgrade soils around poured footings until the forms are stripped and backfilling is set to proceed. Backfilling should commence as soon as allowable after forms are removed.

Temporarily mounding fill over poured footings to protect from frost penetration during freezing temperatures could also be implemented.

Interior foundations are of particular concern with regard to frost protection. These typically are not constructed below the depth of maximum frost penetration. The contractor should be made responsible to provide frost protection measures until the building is up and heated.

Footings should also be designed and coordinated with respect to new utilities that will be located within the building footprint. Footings should not be located above any underground utility unless they are designed so as not to overstress the pipes and will not be undermined if a pipe breaks and soil migrates from below the footings into the pipe. Continuous strip footings should be designed to "bridge" over below ground utilities or should be stepped down so pipes pass through the foundation walls. Isolated column footings should either be dropped below the invert of the pipes or be located well away from them.

For column footings that are smaller than 3 feet in least lateral dimension (width or diameter), the recommended bearing pressure should be reduced to one-third of the above value multiplied by the least lateral footing dimension in feet in accordance with the Ninth Edition of The Massachusetts State Building Code (MSBC).

Regardless of the recommended allowable bearing capacity, continuous footings should be at least 24 inches wide and column footings (rectangular and/or circular) should be no less than 36 inches wide in the least lateral dimension unless the recommended bearing capacity is reduced as discussed above.

Provided the recommendations presented herein are followed under appropriate geotechnical engineering observation, a maximum allowable bearing capacity of 3 tons per square foot is recommended for use in the design of foundations.

Following the above criteria, total building foundation settlements are not expected to exceed 1 inch with differential settlements expected to be about ½ inch or less.

Ground Floor Slab Support

Slab-on-grade construction is recommended provided existing asphalt, utilities, existing foundations, and existing fill deposits are removed from within the proposed building area and replaced with compacted Structural Fill or Crushed Stone as discussed above.

We recommend that bedrock be removed a minimum of 16 inches below bottom of slab elevation. Overblast below subgrade levels could remain in-place provided that it is treated as previously discussed in “Rock Blasting and Excavation.”

The lower level basement slab should bear directly on a 16-inch thick minimum layer of compacted $\frac{3}{4}$ inch Crushed Stone meeting the recommended gradation requirements shown in Table 1. The crushed stone should be compacted to an unyielding surface.

Seismic Design Criteria

Based on the results of our recent explorations, the site of the proposed building is considered a Site Class C soil site in accordance with Section 1613 of the MSBC. In accordance with table 1604.11 in the MSBC, maximum considered earthquake response accelerations factors of $S_S=0.196$ and $S_1=0.066$ should be utilized for the town of Westwood.

The maximum considered earthquake spectral response accelerations adjusted for Site Class effects are $S_{MS}=0.235$ and $S_{MI}=0.112$ in accordance with Section 1613.5.3. Design spectral response accelerations of $S_{DS}=0.157$ and $S_{D1}=0.075$ (in accordance with Section 1613.5.4) should be used in determining the Seismic Design Category.

Basement Foundation Walls

Basement foundation walls with unbalanced loading should be designed to resist lateral earth pressures. For foundation walls (rigid walls, at-rest pressures) use an equivalent fluid pressure of 65 pcf times the height of the walls.

These values are for horizontal backfilled and assume that the walls (where backfill behind the walls is exposed to rainfall) are backfilled with “clean” free draining Structural Fill (less than 8 percent passing the No. 200 sieve) or Sand and Gravel within at least 3 feet of the walls and are drained so that no water pressure develops behind the wall.

Walls should also be designed for appropriate sloping backfill, surcharge (e.g., floor loads), and seismic loads per Section 1610.2 of the Massachusetts State Building Code. The minimum total soil unit weight that should be utilized in calculating these forces is 135 pounds per cubic foot.

For basement foundation walls where backfill behind the wall is exposed to rainfall, a 4-inch diameter perforated PVC pipe surrounded by Crushed Stone and wrapped in a non-woven geotextile should be provided as described below in the “Perimeter Foundation Drain” section to provide discharge of penetrating surface and rainwater. As previously indicated backfill placed

within a 3-foot lateral distance behind these walls should be free draining and have less than 8 percent fines passing the No. 200 sieve.

The following coefficients of friction to resist sliding between mass concrete and various bearing materials are recommended:

<u>Bearing Material</u>	<u>Recommended Sliding Coefficient</u>
Crushed Stone	0.6
Controlled, Compacted Sand and Gravel	0.4
Controlled, Compacted Structural Fill	0.35
Natural Undisturbed Glacial Till	0.4

The minimum factors of safety for sliding and overturning under static loads should be 1.5 and 2 respectively. Passive pressure at the toe of the walls should not be included as a resisting force when analyzing for overturning and sliding.

Groundwater Control, Moisture Mitigation, and Dewatering

We recommend perimeter foundation and slab underdrain systems be installed for the proposed basement due to the potential for water to become perched on or within the silty natural soils or bedrock. Each is discussed below separately.

Perimeter Foundation Drain

The basement perimeter foundation drain should consist of a four-inch minimum diameter perforated PVC pipe surrounded in at least six inches of $\frac{3}{4}$ crushed stone and wrapped in a geotextile filter fabric. The perimeter drain should be laid flat at an invert elevation at least 12 inches below the underside of the lowest ground floor elevation to match the invert elevation of the slab underdrain pipes.

The perimeter foundation drain should connect to the slab underdrain system via sleeves through the foundation footings at two opposite building corners and run to collection pits as discussed further below.

All basement foundation walls should be backfilled with “clean” free draining Structural Fill (less than 8 percent passing the No. 200 sieve) within at least 3 feet of the walls so that no water pressure develops behind the walls. The exterior vertical and horizontal surfaces of all below grade basement walls should be waterproofed prior to backfilling.

As a further measure to control water, ground surfaces immediately around the buildings should be covered with loam, asphalt, or concrete and should be sloping downward away from the structures and surface runoff should be diverted away from the buildings toward storm drains.

Slab Underdrain

For the reason previously mentioned, a slab underdrain system is recommended to transport groundwater (perched or otherwise) from immediately below the building and mitigate groundwater buildup beneath the basement slab. The slab underdrain system should consist of a 16 inch thick layer of compacted crushed stone with four-inch (4") minimum diameter single wall corrugated polyethylene pipe encased in a synthetic wrap (ADS sock® or equivalent) along the interior face of the buildings' exterior foundation wall with lateral drains evenly spaced.

The pipes should be laid flat on 4 inches of crushed stone with their inverts located 12 inches below bottom of slab. The contractor should join pipe splices using product (ADS®) recommended couplers, elbows and wyes where necessary and watertight cleanouts should be located at pipe intersections and 90-degree bends. If requested, MGA could provide recommendations for the location and spacing of the slab underdrain system.

Following installation, the underdrain should be backfilled with crushed stone a minimum distance of 8 inches above the top of the pipe. The stone should be compacted making a minimum of four passes with hand vibratory compaction equipment to avoid crushing the pipe. Additional fill placed above the surface of the crushed stone to reach the underside of the basement floor slab should consist of crushed stone.

The slab underdrain pipes should connect to the perimeter drains via sleeves through the foundation/foundation walls at two opposite building corners and run to a collection pit(s) located along the interior or exterior of the building. The collection pit(s) should be equipped with an electrical pump along with a backup pump connected to a generator and backup generator if deemed necessary by the owner. The pump should be sized to handle a peak flow of 20 gallons per minute and outlet to the local storm drains (if possible), or daylight to a reliable source that will not flood or back-up into the basement.

Moisture Mitigation

We recommend that a moisture vapor barrier (e.g., virgin HDPE polyethylene membrane having a permeance of 0.1 perm or lower per ASTM E1745, or concrete additive providing comparable protection) be provided below the basement slab if humidity control is desired, if materials will be stored on the floors, or if vapor-sensitive floor coatings may be used. Without a vapor retarder or other similar preventive measure, moisture could penetrate up through the concrete floors and contribute to space humidity, potential condensation on the concrete floor surfaces and deterioration of vapor-sensitive floor covering. Detailed recommendations for vapor barrier design and installation are described in ACI 302.2R-06 "Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials".

Dewatering

We anticipate that the basement excavation may be below the stabilized groundwater level at the site based on explorations conducted at the adjacent site of the proposed CVS building. If encountered, we recommend that groundwater be drawn down at least to the base of the crushed

stone layer of the excavation to provide dry working conditions and to help minimize instability of the excavation bottom.

We anticipate groundwater control (if required) may be accomplished using open pits and sumps. The Contractor should be solely responsible for the design, construction, and performance of dewatering systems.

Discharge of pumped water is subject to local, state and federal regulations. The contractor should conduct dewatering and discharge water in accordance with all applicable regulations.

The contractor should implement temporary surface water runoff control measures during construction. Temporary measures should include, but are not necessarily limited to, the use of small earth berms or construction of a drainage ditch adjacent to the top of proposed excavations to divert and/or reduce the amount of surface water flowing over exposed slopes and into excavations during construction.

Temporary Excavation Support

Due to the depth of excavation (10± to 14± feet from existing grades to basement finished floor, not including slab/footing and base course thicknesses) and the proximity of the adjacent pavement areas, a temporary earth support system will likely be required along portions of the perimeter of the proposed building (particularly the north side) to protect adjacent property against excessive movements caused by the excavation and to control the lateral extent of excavations and the volume of excavated soil.

In addition to consideration of the above factors, the types of excavation support system suitable for a particular project depends on the local subsurface soil conditions, the depth and width of the excavation, and the compatibility of the support system with the other construction requirements.

If required, design of these wall systems should be performed by a registered professional engineer engaged by the contractor. MGA can provide additional information as the project moves towards construction, if requested. We recommend that any temporary excavation support design be submitted for MGA's review prior to construction.

CONSTRUCTION OBSERVATION AND REVIEW

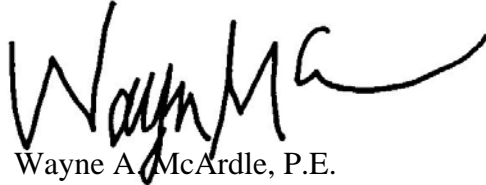
It is recommended that MGA be retained to perform on-site construction observation and soil testing services during the earthwork phase of this project. The purpose of our services is to assess the contractor's compliance with the project plans and specifications as well as our recommendations included in this report. Our on-site presence will allow us the opportunity to provide geotechnical engineering input on a timely basis if encountered subsurface conditions differ from those reported herein.

We respectfully request the opportunity to review final site and foundation plans and earthwork specifications (if any) for the project to see that our recommendations have been properly interpreted and included.

We appreciate the opportunity to assist you on this project and look forward to providing construction observation services as the project moves forward. Please feel free to contact us should you have any questions regarding this report or require additional information.

Very truly yours,

MCARDLE GANNON ASSOCIATES, INC.



Wayne A. McArdle, P.E.
Principal



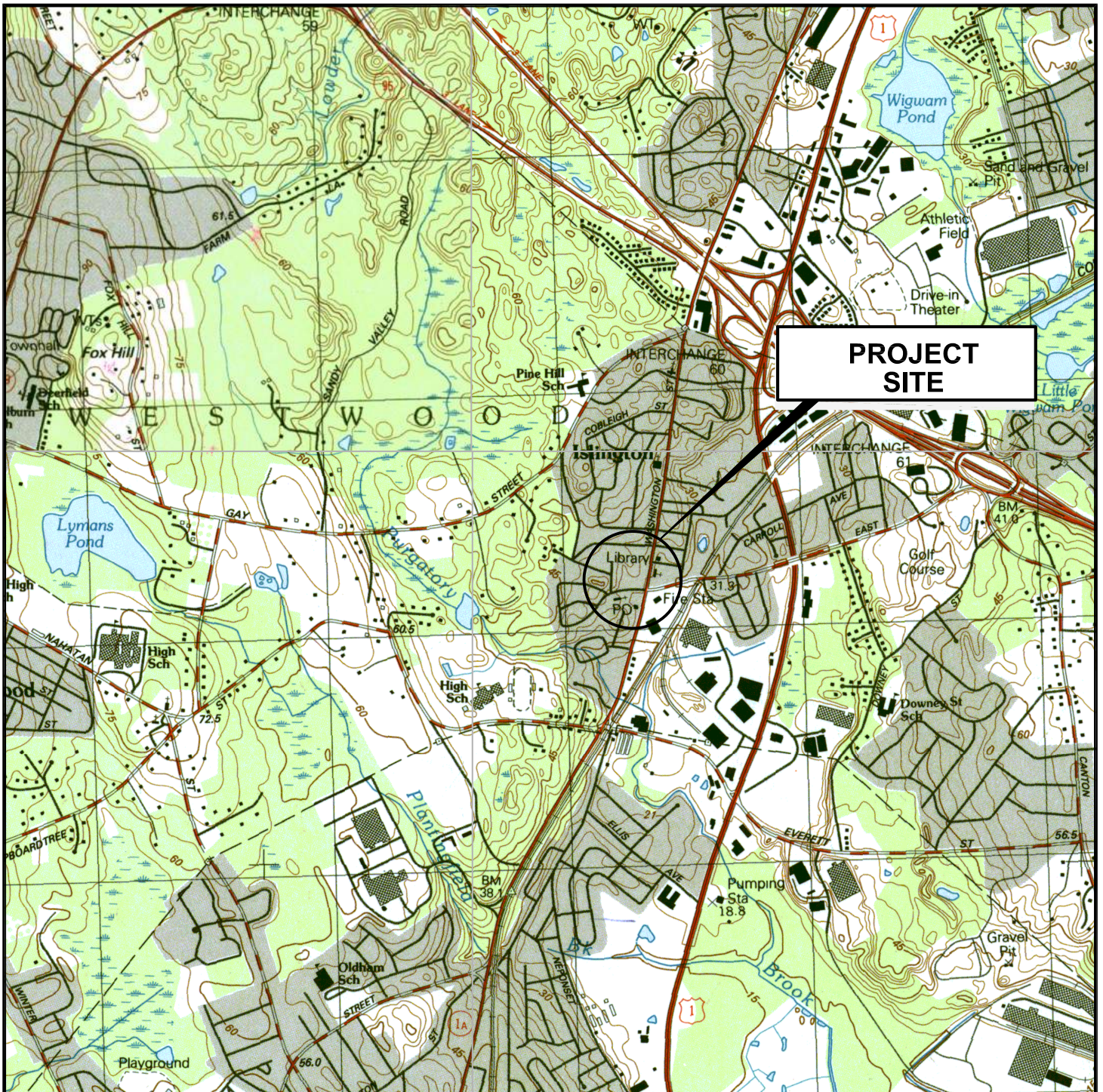
Robert E. Drown, P.E.
Geotechnical Engineer

WAM/RED/red

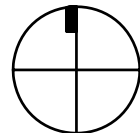
cc: Giorgio Petruzzello, Supreme Companies

- Attachments:
- Figure 1 – Site Locus
 - Figure 2 – Exploration Location Plan
 - Table 1 – Recommend Use and Gradation Criteria for Fill Material
 - Appendix A - Statement of Limitations
 - Appendix B – Test Pit Logs
 - Appendix C – Test Pit Photo Log
 - Appendix D – Geotechnical Laboratory Test Results

FIGURES



SCALE: 1"=1500'



MGA McArdle Gannon Associates, Inc.
Engineers & Consultants

300 Oak Street, Suite 460 781.826.0040 phone
Pembroke, MA 02359 781.735.0418 fax

LOCUS PLAN
WENTWORTH HALL LIBRARY EXPANSION

WASHINGTON STREET
WESTWOOD, MASSACHUSETTS

SKETCH NO.:

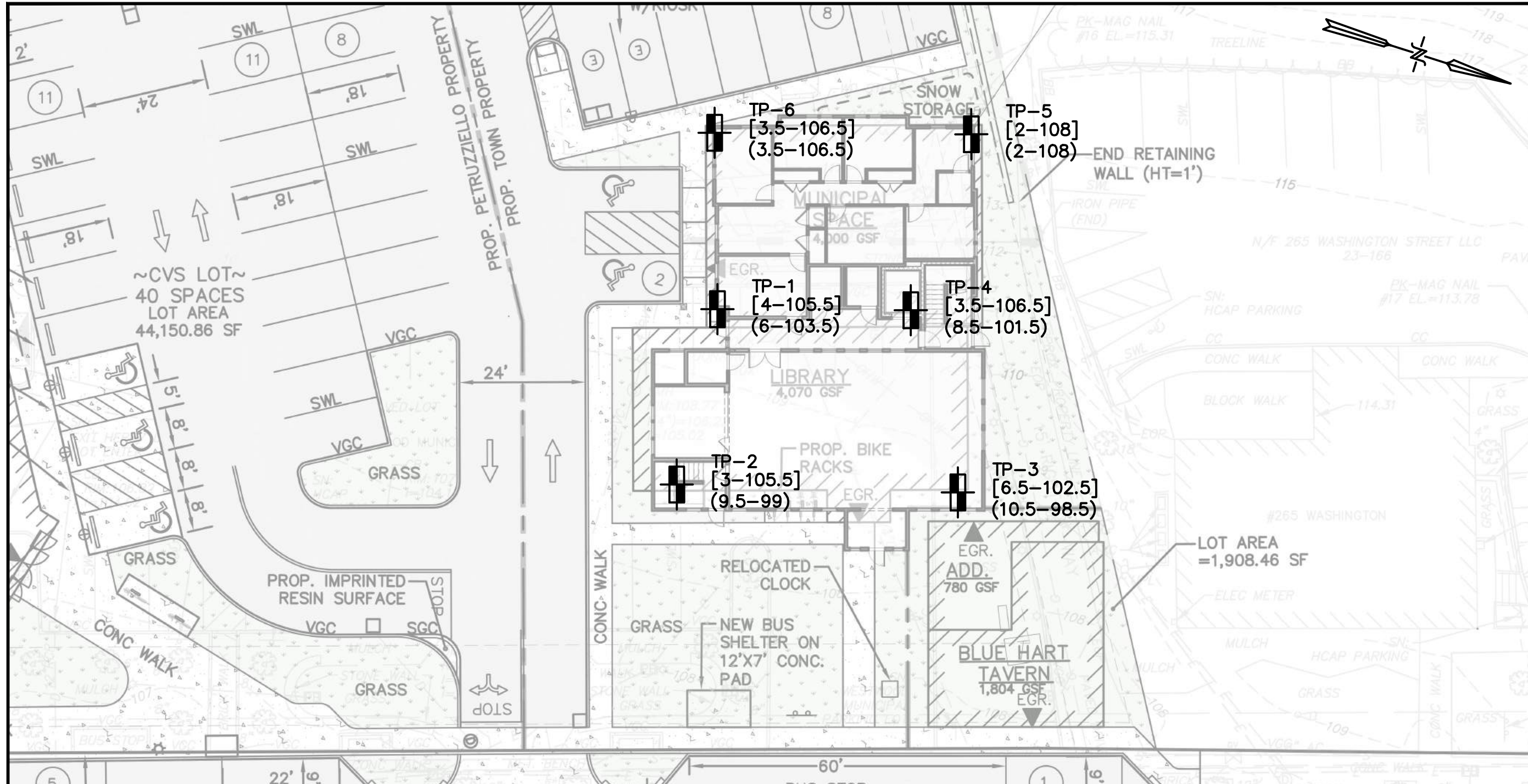
FIG. No. 1

PROJECT: W0763

DATE: 6/2019

SCALE: AS NOTED

DRAWN: RED
CHECKED: WAM




SKETCH NO.:
FIG. No. 2

DRAWN: RED
CHECKED: WAM

EXPLORATION LOCATION PLAN
WENTWORTH HALL LIBRARY EXPANSION
ISLINGTON VILLAGE, WESTWOOD, MASSACHUSETTS
PROJECT: W0763 DATE: 06/2019 SCALE: AS NOTED

MGA McArdle Gannon
Associates, Inc.
Engineers & Consultants
300 Oak Street, Suite 460
Pembroke, MA 02359
781.826.0040 phone
781.735.0418 fax

LEGEND:

-  TEST PITS PERFORMED BY A. DIMARTINO CONSTRUCTION OF NORFOLK, MA ON MAY 20, 2019.
- [10-100] INDICATES APPROXIMATE DEPTH-ELEVATION OF BOTTOM OF EXISTING FILL AT TEST PIT LOCATION.
- (10-100) INDICATES APPROXIMATE DEPTH-ELEVATION OF BUCKET REFUSAL ON PROBABLE BEDROCK AT TEST PIT LOCATION.

NOTES:

1. BASE PLAN DEVELOPED FROM PLAN ENTITLED "LAYOUT SITE PLAN," SHEET L-1.2, DATED APRIL 02, 2019 BY MCKAY ARCHITECTS.
2. THE TEST PIT LOCATIONS SHOWN WERE DETERMINED BY TAPE MEASUREMENT FROM EXISTING SITE FEATURES. TEST PIT LOCATIONS ARE APPROXIMATE.
3. MGA OBSERVED AND LOGGED THE TEST PITS SHOWN.

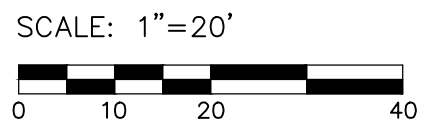


TABLE 1

**RECOMMENDED USE AND GRADATION CRITERIA FOR
FILL MATERIALS**

USE OF MATERIALS

Off-site Structural Fill: Backfill inside building area below base course and free draining backfill behind foundation walls and above underdrains
Sand and Gravel: Free draining fill behind foundation walls and above underdrains
Crushed Stone: Soil cushion below footings, base course layer below basement slab and as working mat in areas of sensitive silty subgrade

GRADATION REQUIREMENTS

OFF-SITE STRUCTURAL FILL – shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. Structural Fill shall conform to the following gradation requirements:	
Sieve Size	Percent Passing by Weight
*	100
No. 10	30 – 95
No. 40	10 – 70
No. 200	0 – 12**
*Two thirds (2/3) of the loose lift thickness. **0 – 8 for free-draining fill behind basement foundation walls and above underdrains.	

SAND AND GRAVEL – shall consist of durable sand and gravel and shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. Sand and Gravel shall conform to the following gradation requirements:	
Sieve Size	Percent Passing by Weight
4 inches	100
½ inch	50 – 85
No. 4	40 – 75
No. 10	30 – 60
No. 40	10 – 35
No. 100	5 – 20
No. 200	2 – 8

CRUSHED STONE – shall consist of durable crushed rock or durable crushed gravel stone and shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. Crushed Stone shall conform to the following gradation requirements:	
Sieve Size	Percent Passing by Weight
1 inch	100
¾ inch	90-100
½ inch	10-50
3/8 inch	0 – 20
No. 4	0 – 5

APPENDIX A: STATEMENT OF LIMITATIONS

STATEMENT OF LIMITATIONS

Explorations

The analysis and recommendations submitted in this report are based in part upon the data obtained from 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.

The stratification lines on the logs represent the approximate boundary between soil types and the transition may be gradual.

Water level readings have been made in the explorations at the time and under the conditions stated on the logs. This data has been reviewed and interpretations 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 that are different from the time the measurements were made.

Review

In the event that any change in the nature, design or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

It is recommended that this firm be provided the opportunity for a general review of final design and specifications in order that earthwork recommendations may be properly interpreted and implemented in the design and specifications.

Construction

It is recommended that this firm be retained to provide soil engineering services during the construction phase of the work. This is to observe compliance with design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

Use of Report

This preliminary report has been prepared for the exclusive use of McKay Architects for specific application to the Wentworth Hall Library Expansion at Islington Village on Washington Street in Westwood, Massachusetts, in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

APPENDIX B: TEST PIT LOGS



McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST PIT LOG

TEST PIT NO. TP-1

PROJECT: Wentworth Hall Library Exp-Washington St. Westwood, MA
CLIENT: McKay Architects, Inc.
CONTRACTOR: A. DiMartino Construction

MGA NO. : W0763
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 109.5±
DATE START : 5/20/2019
END : 5/20/2019
ENGINEER : R. Drown, P.E.

EQUIPMENT: Caterpillar 315CL Excavator

OPERATOR: Tony DiMartino

GROUNDWATER			
Date	Time	Depth (ft.)	Notes
5/20/19	7:50	---	Not Encountered

Depth in Feet	Strata Change	Sample Number/Type	Sample Depth Range (ft)	Elevation/Depth (ft)	SOIL DESCRIPTION (BURMISTER)	REMARKS
0				109.0	-ASPHALT-	
0.5				109.0 0.5		
2		S-1	1.0 4.0		Brown, fine to coarse SAND and fine to coarse GRAVEL, some Cobbles, some (-) Boulders, trace (+) Silt.	
4				105.5 4.0	-FILL- Gray, fine to coarse SAND and fine to coarse GRAVEL, little (+) Silt, little (-) Cobbles, trace (-) Boulders.	
6				103.5 6.0	-GLACIAL TILL- BUCKET REFUSAL ON PROBABLE BEDROCK AT 6 FEET	
8						
10						

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: <u>4'</u> Feet Length: <u>6'</u> Feet	6" to 18" Diameter= <u>>20</u> 18" to 36" Diameter= <u>0</u> Over 36" Diameter= <u>0</u> (number)	- B - Bag - J - Jar - P - Percolation Test	Overburden: Rock: Samples:
			TEST PIT NO. TP-1



McArdle Gannon Associates, Inc.

TEST PIT LOG

TEST PIT NO. TP-2

PROJECT: Wentworth Hall Library Exp-Washington St. Westwood, MA
CLIENT: McKay Architects, Inc.
CONTRACTOR: A. DiMartino Construction

MGA NO. : W0763
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 108.5±
DATE START : 5/20/2019
END : 5/20/2019
ENGINEER : R. Drown, P.E.

EQUIPMENT: Caterpillar 315CL Excavator

OPERATOR: Tony DiMartino

GROUNDWATER			
Date	Time	Depth (ft.)	Notes
5/20/19	8:15	---	Not Encountered

Depth in Feet	Strata Change	Sample Number/Type	Sample Depth Range (ft)	Elevation/Depth (ft)	SOIL DESCRIPTION (BURMISTER)	REMARKS
0				108.0	-ASPHALT-	
0.5				105.5	Brown, fine to coarse SAND and fine to coarse GRAVEL, some (-) Boulders/ Cobbles, little Silt.	
2				105.5	-FILL-	
3.0				101.5	Beige to gray, fine to coarse SAND, little (-) Silt, trace fine Gravel.	
4		S-1	4.0 6.0	101.5	-SAND-	
6				101.5	-GLACIAL TILL-	
7.0				99.0	Gray, fine to coarse SAND, some fine to coarse Gravel, little (+) Cobbles, little Silt, trace Boulders.	
8				99.0	BUCKET REFUSAL ON PROBABLE BEDROCK AT 9.5 FEET	
9.5				99.0		
10						

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: <u>5'</u> Feet Length: <u>6'</u> Feet	6" to 18" Diameter= <u>>20</u> 18" to 36" Diameter= <u>1</u> Over 36" Diameter= <u>0</u> (number)	- B - Bag - J - Jar - P - Percolation Test	Overburden: Rock: Samples:
			TEST PIT NO. TP-2



McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST PIT LOG

TEST PIT NO. TP-3

PROJECT: Wentworth Hall Library Exp-Washington St. Westwood, MA
CLIENT: McKay Architects, Inc.
CONTRACTOR: A. DiMartino Construction

MGA NO. : W0763
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 109±
DATE START : 5/20/2019
END : 5/20/2019
ENGINEER : R. Drown, P.E.

EQUIPMENT: Caterpillar 315CL Excavator

OPERATOR: Tony DiMartino

GROUNDWATER			
Date	Time	Depth (ft.)	Notes
5/20/19	8:45	---	Not Encountered

Depth in Feet	Strata Change	Sample Number/Type	Sample Depth Range (ft)	Elevation/Depth (ft)	SOIL DESCRIPTION (BURMISTER)	REMARKS
0					Dark brown, fine to medium SAND, some Silt, little (+) Roots. -TOPSOIL-	
2				108.0 1.0	Brown to dark brown, fine to coarse SAND and fine to coarse GRAVEL, little (+) Silt, little Cobbles, trace (+) Boulders, trace (-) Metal, trace (-) Roots. -FILL-	
6				102.5 6.5	Gray, fine to coarse GRAVEL and fine to coarse SAND, some (-) Cobbles, little Silt. -GLACIAL TILL-	
10				98.5 10.5	BUCKET REFUSAL ON PROBABLE BEDROCK AT 10.5 FEET	

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: <u>5'</u> Feet Length: <u>8'</u> Feet	6" to 18" Diameter= <u>10±</u> 18" to 36" Diameter= <u>0</u> Over 36" Diameter= <u>0</u> (number)	- B - Bag - J - Jar - P - Percolation Test	Overburden: Rock: Samples:
			TEST PIT NO. TP-3



McArdle Gannon Associates, Inc.

TEST PIT LOG

TEST PIT NO. TP-4

PROJECT: Wentworth Hall Library Exp-Washington St. Westwood, MA
CLIENT: McKay Architects, Inc.
CONTRACTOR: A. DiMartino Construction

MGA NO. : W0763
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 110±
DATE START : 5/20/2019
END : 5/20/2019
ENGINEER : R. Drown, P.E.

EQUIPMENT: Caterpillar 315CL Excavator

OPERATOR: Tony DiMartino

GROUNDWATER			
Date	Time	Depth (ft.)	Notes
5/20/19	9:05	---	Not Encountered

Depth in Feet	Strata Change	Sample Number/Type	Sample Depth Range (ft)	Elevation/Depth (ft)	SOIL DESCRIPTION (BURMISTER)	REMARKS
0				109.5	-ASPHALT-	
0.5				106.5		
2		S-1	1.0 3.0		Brown, fine to coarse SAND and fine to coarse GRAVEL, little (-) Silt, trace (+) Cobbles, trace (-) Boulders.	
4				106.5		
6				3.5		
8				101.5		
8.5				8.5	BUCKET REFUSAL ON PROBABLE BEDROCK AT 8.5 FEET	
10						

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: <u>5'</u> Feet Length: <u>8'</u> Feet	6" to 18" Diameter= <u>>20</u> 18" to 36" Diameter= <u>1</u> Over 36" Diameter= <u>0</u> (number)	- B - Bag - J - Jar - P - Percolation Test	Overburden: Rock: Samples:
			TEST PIT NO. TP-4



McArdle Gannon Associates, Inc.

TEST PIT LOG

TEST PIT NO. TP-5

PROJECT: Wentworth Hall Library Exp-Washington St. Westwood, MA
CLIENT: McKay Architects, Inc.
CONTRACTOR: A. DiMartino Construction

MGA NO. : W0763
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 110±
DATE START : 5/20/2019
END : 5/20/2019
ENGINEER : R. Drown, P.E.

EQUIPMENT: Caterpillar 315CL Excavator

OPERATOR: Tony DiMartino

GROUNDWATER			
Date	Time	Depth (ft.)	Notes
5/20/19	9:20	---	Not Encountered

Depth in Feet	Strata Change	Sample Number/Type	Sample Depth Range (ft)	Elevation/Depth (ft)	SOIL DESCRIPTION (BURMISTER)		REMARKS
0				108.0 2.0	Brown, fine to coarse GRAVEL and fine to coarse SAND, some Cobbles, little (-) Silt.		
					-FILL-		
2					BUCKET REFUSAL ON PROBABLE BEDROCK AT 2 FEET		
4							
6							
8							
10							

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: <u> 4 </u> Feet Length: <u> 4 </u> Feet	6" to 18" Diameter= <u> 0 </u> 18" to 36" Diameter= <u> 0 </u> Over 36" Diameter= <u> 0 </u> (number)	- B - Bag - J - Jar - P - Percolation Test	Overburden: Rock: Samples:
			TEST PIT NO. TP-5



McArdle Gannon Associates, Inc.
Engineers & Consultants

TEST PIT LOG

TEST PIT NO. TP-6

PROJECT: Wentworth Hall Library Exp-Washington St. Westwood, MA
CLIENT: McKay Architects, Inc.
CONTRACTOR: A. DiMartino Construction

MGA NO. : W0763
SHEET NO. : 1 of 1
LOCATION N : See Plan
E :
ELEVATION : 110±
DATE START : 5/20/2019
END : 5/20/2019
ENGINEER : R. Drown, P.E.

EQUIPMENT: Caterpillar 315CL
Excavator

OPERATOR: Tony DiMartino

GROUNDWATER			
Date	Time	Depth (ft.)	Notes
5/20/19	9:30	---	Not Encountered

Depth in Feet	Strata Change	Sample Number/Type	Sample Depth Range (ft)	Elevation/Depth (ft)	SOIL DESCRIPTION (BURMISTER)	REMARKS
0					Brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt, trace (+) Boulders/Cobbles.	
2						
4				106.5 3.5	-FILL- BUCKET REFUSAL ON PROBABLE BEDROCK AT 3.5 FEET	
6						
8						
10						

TEST PIT DIMENSIONS	BOULDERS	SAMPLE IDENTIFICATION	SUMMARY
Width: <u>4</u> Feet Length: <u>5</u> Feet	6" to 18" Diameter= <u>4</u> 18" to 36" Diameter= <u>0</u> Over 36" Diameter= <u>0</u> (number)	- B - Bag - J - Jar - P - Percolation Test	Overburden: Rock: Samples:
			TEST PIT NO. TP-6

KEY TO SYMBOLS

Symbol Description

Strata symbols



Asphalt



Fill



Glacial Till



Sand



Topsoil

Soil Samplers



Bag Sample

Notes:

1. Test pits performed by A. DiMartino Construction on May 20, 2019 with a Caterpillar 315CL tracked excavator.
2. MGA estimated the ground surface elevation at the explorations from ground surface contours shown on a plan entitled "Existing Conditions Site Plan School Street Side," dated December 12, 2017, by GCG Associates, Inc. Elevations should be considered approximate.
3. Test pits observed and logged by MGA.

APPENDIX C: TEST PIT PHOTO LOG



Photo #1

Test pit TP-1.



Photo #2

Excavated material from test pit TP-1.



Photo #3

Test pit TP-2.



Photo #4

Excavated material from test pit TP-2.



Photo #5

Test pit TP-3.



Photo #6

Excavated material from test pit TP-3.



Photo #7

Test pit TP-4.



Photo #8

Excavated material from test pit TP-4.



Photo #9

Test pit TP-5.



Photo #10

Excavated material from test pit TP-5.



Photo #11

Test pit TP-6.

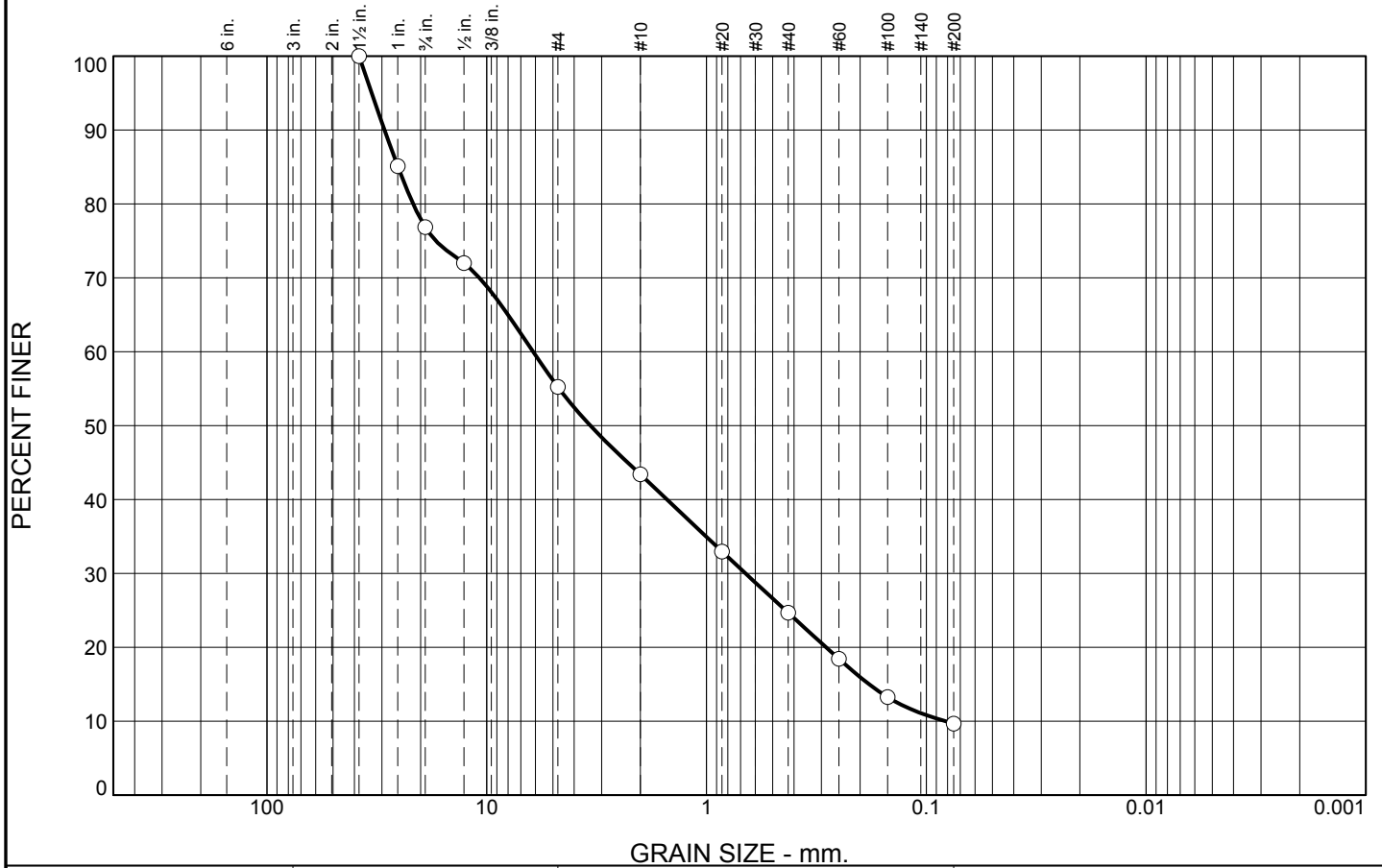


Photo #12

Excavated material from test pit TP-6.

APPENDIX D: GEOTECHNICAL LABORATORY TEST RESULTS

PARTICLE SIZE DISTRIBUTION REPORT



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.1	21.7	11.8	18.7	15.0	9.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	85.1		
3/4	76.9		
1/2	72.0		
#4	55.2		
#10	43.4		
#20	33.0		
#40	24.7		
#60	18.5		
#100	13.3		
#200	9.7		

Material Description

Brown, fine to coarse SAND and fine to coarse GRAVEL, trace (+) Silt.

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 29.1665 D₈₅= 25.3122 D₆₀= 6.1524
D₅₀= 3.3773 D₃₀= 0.6646 D₁₅= 0.1820
D₁₀= 0.0819 C_u= 75.16 C_c= 0.88

Classification

USCS= AASHTO=

Remarks

Water Content: 4.5%
Existing Fill

* (no specification provided)

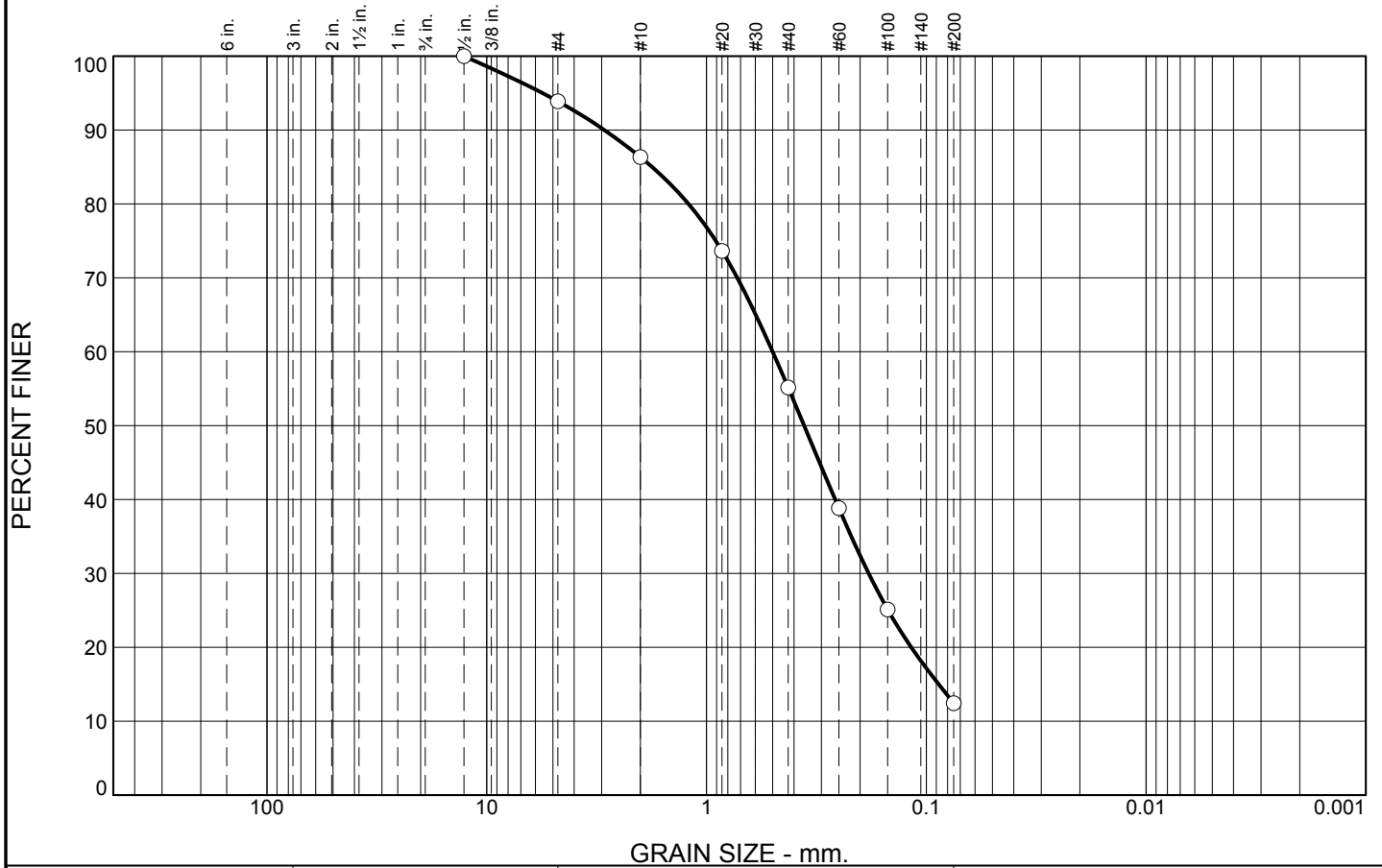
Source of Sample: TP-1 **Depth:** 1-4 ft.
Sample Number: S-1

Date: 05-23-2019



Client: McKay Architects Inc.
Project: Wentworth Hall Library Expansion
 Islington Village, Washington Street, Westwood, MA
Project No: W0763 **Figure**

PARTICLE SIZE DISTRIBUTION REPORT



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.1	7.5	31.2	42.8	12.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2	100.0		
#4	93.9		
#10	86.4		
#20	73.6		
#40	55.2		
#60	38.8		
#100	25.1		
#200	12.4		

Material Description

Beige to gray, fine to coarse SAND, little (-) Silt, trace fine Gravel.

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D₉₀= 2.9134 D₈₅= 1.7670 D₆₀= 0.5000
 D₅₀= 0.3595 D₃₀= 0.1829 D₁₅= 0.0879
 D₁₀= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Water content: 4.9%
 Natural Sand

* (no specification provided)

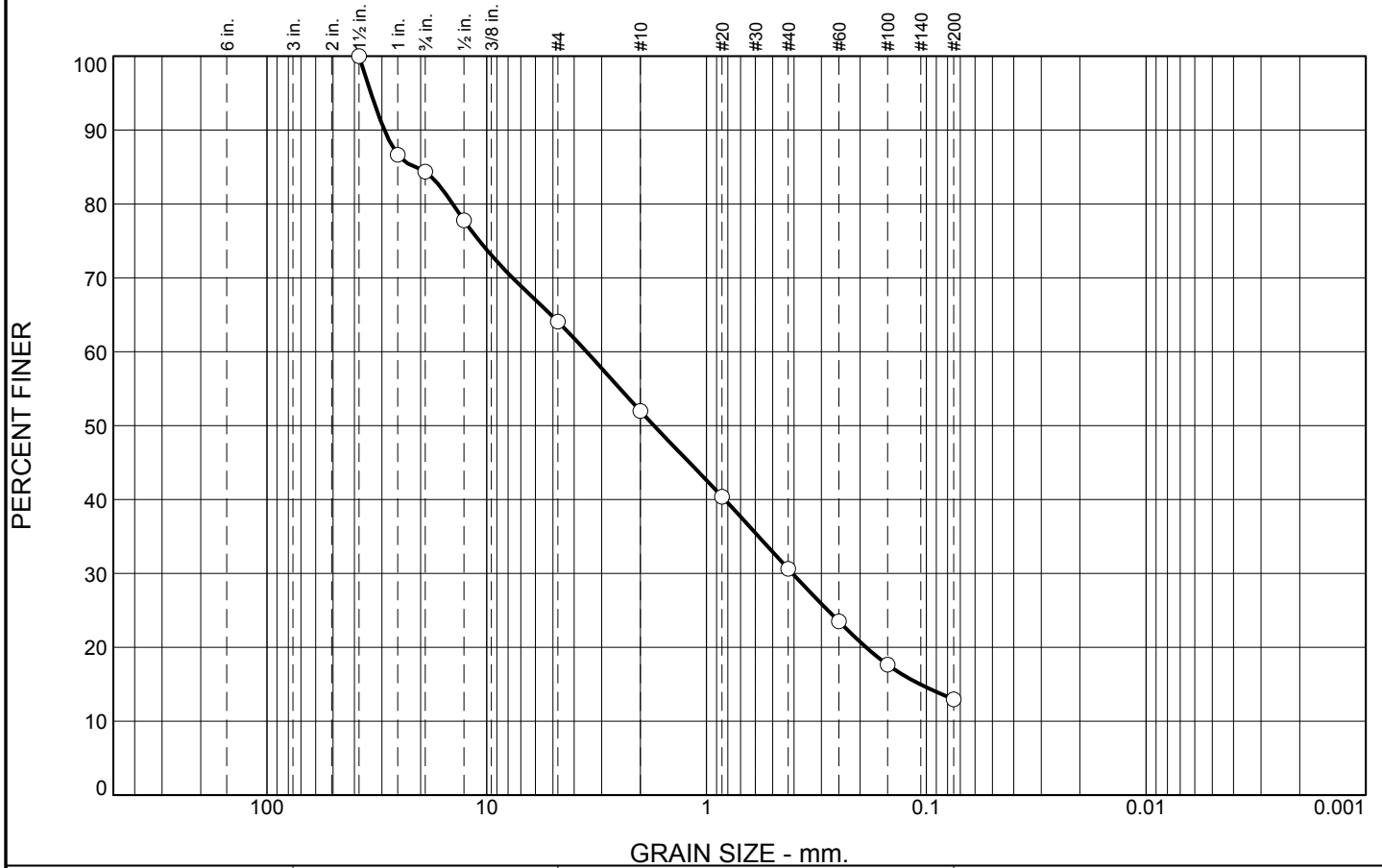
Source of Sample: TP-2 **Depth:** 4-6 ft.
Sample Number: S-1

Date: 05-23-2019



Client: McKay Architects Inc.
Project: Wentworth Hall Library Expansion
 Islington Village, Washington Street, Westwood, MA
Project No: W0763 **Figure**

PARTICLE SIZE DISTRIBUTION REPORT



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	15.6	20.3	12.1	21.4	17.7	12.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	86.7		
3/4	84.4		
1/2	77.8		
#4	64.1		
#10	52.0		
#20	40.4		
#40	30.6		
#60	23.5		
#100	17.6		
#200	12.9		

Material Description

Brown, fine to coarse SAND and fine to coarse GRAVEL, little (-) Silt.

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 29.2046 D₈₅= 21.0950 D₆₀= 3.5136
D₅₀= 1.7333 D₃₀= 0.4064 D₁₅= 0.1067
D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 4.7%
Existing Fill

* (no specification provided)

Source of Sample: TP-4 **Depth:** 1-3 ft.
Sample Number: S-1

Date: 05-23-2019



Client: McKay Architects Inc.
Project: Wentworth Hall Library Expansion
 Islington Village, Washington Street, Westwood, MA
Project No: W0763 **Figure**

FORM FOR GENERAL BID

FROM: _____
TO THE AWARDING AUTHORITY

BASE BID: The Undersigned proposes to furnish all the labor and materials required for the New Wentworth Hall Library for Town of Westwood, MA, in accordance with the Construction Documents, including Drawings and Specifications, all as prepared by McKay Architects, Inc., for the Contract Price specified below, subject to the additions and deductions according to the terms of the Specifications.

This Bid includes Addenda numbered:

The proposed Contract Price (total of Item 1 and Item 2 below) is: _____ dollars

(\$ _____)

ALTERNATES:

ALTERNATE NO. 1 Add \$ _____ Deduct \$ _____

ALTERNATE NO. 2 Add \$ _____ Deduct \$ _____

ALTERNATE NO. 3 Add \$ _____ Deduct \$ _____

DIVISION OF BIDS

The subdivision of the proposed contract price is as follows:

Item 1: The Work of the General Contractor, being all work other than that covered by Item 2:

\$ _____

Item 2: Sub Bids as follows:

Section No.	Sub-Trade	Name of Sub-Bidder	Bid Amount	Bonds Req'd?
04 00 01	Masonry		\$	
07 00 02	Roofing, Flashing, and Sheet Metal		\$	
09 00 02	Tile		\$	
09 00 03	Acoustic Ceilings		\$	
09 00 05	Resilient Flooring		\$	
09 00 07	Painting		\$	
14 00 01	Elevators		\$	
21 00 00	Fire Protection		\$	
22 00 00	Plumbing		\$	
23 00 00	HVAC		\$	
26 00 00	Electrical		\$	

SUB-TOTAL OF ITEM 2 WORK: \$ _____

The undersigned agrees that each of 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 for the performance and payment bonds furnished by sub-bidders as requested herein and that all the cost of all such premiums is included in the amount set forth in Item 1 of this bid.

The undersigned agrees that if he/she is selected as general contractor, he/she will promptly confer with the awarding authority on the question of sub-bidders; 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-bidders at the amounts named in their respective sub-bids and be in every way as responsible for them and their work as if they had been originally named in this general bid, the total contract price being adjusted to conform thereto.

The undersigned agrees that, if he is selected as general contractor, he will within five 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 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; provided, however, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable

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; 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 he will comply fully with all laws and regulations applicable to awards made subject to section 44A.

The undersigned further certifies under the 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 in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty 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 General Laws or any rule or regulation promulgated thereunder.

DATE: _____

NAME OF GENERAL BIDDER: _____

BY: _____ TITLE: _____
(Name of Person signing Bid and Title)

Business Address: _____

State _____ Zip Code _____

Telephone Number: _____

NOTE: This proposal must bear the written signature of the Bidder. If the Bidder is a partnership, the proposal must be signed by a partner. If the Bidder is a corporation, the proposal must be signed by a duly authorized officer or agent of such corporation.

The Bid must be accompanied by the following documents to be given consideration:

Bid Bond Form based on the form provided at Section 00 43 01.10 or Bid Guarantee (Bid Bond or Certified Check)

Certificate of Eligibility DCAM Form CQ7

Completed DCAM Update Statement, Form CQ3

Completed Bidder's Certificate of Non-Collusion, using the form provided at Section 00 43 01.02

Completed Unit Prices Form using the form provided at Section 00 43 01.03.

SECTION 00 41 02

FORM FOR FILED SUB-BID

FROM: _____

TO ALL GENERAL BIDDERS EXCEPT THOSE EXCLUDED:

A. The undersigned proposes to furnish all labor and materials required for completing, in accordance with the hereinafter described plans, specifications and addenda, all the work specified in Section No. _____ of the specifications and in any plans specified in such section, prepared by McKay Architects Inc. for the New Wentworth Hall Library in Westwood, MA, for the contract sum of

_____ dollars
(\$ _____)

For Alternate No. 1; Add \$ _____ Subtract \$ _____

For Alternate No. 2; Add \$ _____ Subtract \$ _____

For Alternate No. 3; Add \$ _____ Subtract \$ _____

B. This sub-bid includes addenda numbered _____

C. This sub-bid

1. may be used by any General Bidder except:

2. may only be used by the following General Bidders:

To exclude general bidders, insert "X" in either line 1 or line 2 above and fill in blank. Do not answer C if no general bidders are excluded.

D. The undersigned agrees that, if he is selected as a sub-bidder, he will, within 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 the general bidder, who shall pay the premiums therefor, or if prequalification is required pursuant to section 44D3/4, furnish a performance and payment bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority, in the full sum of the subcontract price.

E. The names of all persons, firms and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the 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 provision 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 the above list of bids to the undersigned represents bona fide bids based on the hereinbefore described plans, 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.
- G. The undersigned further agrees to be bound to the general contractor by the terms of the hereinbefore described plans, 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.
- H. The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all the requirements of the plans and specifications: --
 - 1. Have been in business under present business name _____ years.
 - 2. Ever failed to complete any work awarded? _____
 - 3. List one or more recent buildings with names of the general contractor and architect on which you served as a sub-contractor for work of similar character as required for the above-named building.

Building	Architect	General Contractor	Amount of Contract

- 4. Bank reference _____
- I. 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; that all employees to be employed at the work site 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 he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44F.
- J. The undersigned further certifies under penalties of perjury that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty 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 General Laws or any rule or regulation promulgated thereunder.

Date: _____

By: _____

(Name of Sub-bidder)

By: _____

(Title and Name of Person Signing Bid)

(Business Address)

(City and State)

NOTE: This proposal must bear the written signature of the Bidder. If the Bidder is a partnership, the proposal must be signed by a partner. If the Bidder is a corporation, the proposal must be signed by a duly authorized officer or agent of such corporation.

The Bid must be accompanied by the following documents to be given consideration:

- a. Bid Bond Form based on the form provided at Section 00 43 01.10, or Guarantee (Bid Bond or Certified Check)
- b. Certificate of Eligibility DCAM Form CQ7
- c. Completed DCAM Update Statement, Form CQ3
- d. Completed Bidder's Certificate of Non-Collusion using on the form provided at Section 00 43 01.50
- e. Completed Unit Prices Form, using the form provided at Section 00 43 22.

END OF SECTION

SECTION 00 43 01

BID FORM SUPPLEMENTS

PART 1 - GENERAL

1.01 FORMS TO BE SUBMITTED WITH THE BIDS.

- A. Pursuant to other Division 00 and Division 01 requirements of this specification and M.G.L. Bidding requirements, the contractor shall submit the following additional documentation with their bids.
- B. The Following forms shall be completed and submitted with the bids:
 - 1. Document 00 43 01.10 - Bid Bond Form
 - 2. Document 00 43 01.02 - Bidder's Certificate of Non-Collusion
 - 3. Document 00 43 01.03 - Unit Prices Form
- C. Additional documents are required to be submitted with the bid, but are not provided in this specification, and shall be provided by the bidder:
 - 1. DCAM Certificate of Eligibility
 - 2. Current DCAM Update Statement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 00 43 01.01

BID BOND FORM

KNOW ALL MEN BY THESE PRESENTS, THAT WE, THE UNDERSIGNED

_____ as Principal, and
_____ as Surety

are hereby held and firmly bound unto the Town of Westwood, MA, as Owner, in the penal sum of
\$ _____

for the payment for which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____ 20 ____.

The Condition of the above obligation is such that whereas the Principal has submitted to the General Contractor, a certain Bid, attached hereto and hereby made a part hereof, to enter into a Contract in writing for construction of the New Wentworth Hall project.

NOW, THEREFORE,

1. If said Bid shall be rejected, or in the alternate,
2. If said Bid shall be accepted and the Principal shall execute and deliver a Contract in the Form of Contract attached (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all respects perform the Agreement created by acceptance of said Bid.

Then the Condition of this Obligation is such that if the aforesaid principal shall be awarded the contract the said Principal will, within the time required, enter into a formal contract and give a good sufficient bond to secure the performance of the terms and conditions of the contract, then this obligation to void; otherwise the Principal and Surety will pay unto the Obligee the difference in money between the amount of the bid of the said Principal and the amount for which the Obligee legally contracts with another party to perform the work if the later amount be in excess of the former, but in no event shall liability hereunder exceed the penal sum hereof.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

PRINCIPAL: _____ **BY:** _____

SURETY SEAL: _____ **BY:** _____

SECTION 00 43 01.02

BIDDER'S CERTIFICATE OF NON-COLLUSION

NEW WENTWORTH HALL - 280 WASHINGTON STREET, WESTWOOD, MA

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club or other organization, entity, or group of individuals.

DATED: _____

NAME OF BIDDER: _____
(COMPANY NAME)

BY: _____
(OFFICER'S NAME & TITLE)

SIGNATURE: _____

THIS FORM MUST BE SUBMITTED WITH YOUR BID

SECTION 00 43 01.03

UNIT PRICES FORM

WESTWOOD NEW WENTWORTH HALL PROJECT

The following is the list of Unit Prices associated with the Bid submitted by:

FROM: _____
(Name of Sub-Bidder or Bidder)

TO: The Town of Westwood

DATE: _____

This Unit Price form is an integral part of the Bid Form.

The following are Unit Prices for specific portions of the Work as listed, and are applicable to authorized variations from the Contract Documents.

UNIT PRICE LIST

ITEM	DESCRIPTION	ADD	DEDUCT
Trench Earth Excavation	(0-6 ft. depth) - Price per cubic yard of material	\$	\$
Trench Earth Excavation	(Over 6 ft. to 12 ft. depth) Price per cubic yard of material	\$	\$
Mass Rock Excavation	Boulders over 2 C.Y. in size - Price per cubic yard of material	\$	\$
Trench Rock Excavation	(0-6 foot depth) Price per cubic yard of material.	\$	\$
Trench Ledge Excavation	Up to 6 feet depth, larger than 3 C.Y. in size, including demolition, excavating, loading, and hauling offsite for disposal.	\$	\$
Open Ledge Excavation	Open demolition larger than 3 C.Y. in size, excavation, loading, and hauling offsite for disposal. Unit Price per cubic yard of materials removed.	\$	\$
Structural Fill	Compacted, in-place - price per cubic yard of material	\$	\$
Graded Gravel Fill "Granular Fill",	Compacted, in-place - price per cubic yard of material	\$	\$
Crushed Washed Stone	(3/4 inch) - price per cubic yard of material	\$	\$
Crushed Washed Stone	(1-1/2 inch) - price per cubic yard of material	\$	\$
Slope Stabilization Fabric	Installed- price per square yard of material	\$	\$
Waterline pipe	8-inch diameter Cement-lined Ductile iron, with fittings and bedding, exclusive of excavation, 0-6' depth - price per linear foot of material	\$	\$
Waterline pipe	6-inch diameter Cement-lined, Ductile iron, with fittings and bedding, exclusive of excavation, 0'-6' depth - price		

	per linear foot of material	\$	\$
Waterline pipe	4" dia Cement-lined, Ductile iron, with fittings and bedding, exclusive of excavation, 0'-6' depth - price per linear foot of material	\$	\$
Sewer line pipe	6" dia. SDR 35, PVC pipe, with fittings and bedding, exclusive of excavation, 0-6' depth - price per linear foot of material	\$	\$
Precast, 4-foot dia. Sewer manhole	With frame/cover, fittings, inverts, and bedding, exclusive of excavation, 0'-8' depth	\$	\$
Drain line pipe, 12"HDPE	with fittings, inverts, and bedding, exclusive of excavation, 0 - 6 ft. depth - price per linear foot of piping	\$	\$
Precast Catch basin, 4 foot diameter	with frame/grate, fittings, inverts, and bedding, exclusive of excavation, 0 - 8 ft. depth - Price per each unit	\$	\$
Precast Drainage Manhole, 4-foot diameter	Including frame/cover, fittings, inverts, and bedding, exclusive of excavation, 0 - 8 ft. depth - price per each unit	\$	\$

SECTION 00 50 00

CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 FORMS TO BE COMPLETED AS A CONDITION OF CONTRACT EXECUTION

- A. The General Contractor and Subcontractors shall complete the following forms and certifications at the time of execution of the contract.
- B. Performance Bond: See Attachments to Section 00 52 00 - Contract & General Conditions
- C. Labor and Materials Payment Bond: See Attachments to Section 00 52 00 - Contract & General Conditions
- D. Document 00 50 00.10 - Bidders' Certificate of Tax Compliance.
- E. Document 00 50 00.20 - Bidder's Certificate of Labor Harmony and OSHA Compliance
- F. Document 00 50 00.30 - Bidder's Certificate of Payment of Prevailing Wages

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

CERTIFICATE OF TAX COMPLIANCE

NEW WENTWORTH HALL PROJECT - WESTWOOD, MA

This certification shall be prepared by a Certified Public Accountant responsible for accounting of the Bidding firm. Pursuant to M.G.L. Chapter 62C, sec. 49A, the undersigned certifies that, to the best of my knowledge and belief, have complied with all the laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting of child support.

DATED: _____

NAME OF BIDDER: _____
(COMPANY NAME)

RESPONDENT CPA's
COMPANY NAME, (if
different from Bidder): _____
(CPA COMPANY NAME)

RESPONDENT CPA's
ADDRESS (If different
from Bidder): _____

RESPONDENT CPA's
PHONE NUMBER: _____

BY: _____
(RESPONDENT CPA's NAME)

RESPONDENT'S
SIGNATURE: _____

RESPONDENT'S TITLE: _____

THIS CERTIFICATION MUST BE COMPLETED AS A CONDITION OF CONTRACT EXECUTION.

CERTIFICATE OF LABOR HARMONY AND OSHA COMPLIANCE

NEW WENTWORTH HALL PROJECT - WESTWOOD, MA

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; 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 he will comply fully with all laws and regulations applicable to awards made subject to Section 44E.

DATED: _____

NAME OF BIDDER: _____
(COMPANY NAME)

BY: _____
(OFFICER'S NAME)

SIGNATURE _____

THIS CERTIFICATION MUST BE COMPLETED AS A CONDITION OF CONTRACT EXECUTION

SECTION 00 50 00.30

CERTIFICATE OF PAYMENT OF PREVAILING WAGES

The undersigned bidder hereby certifies, under the pains and penalties of perjury, that the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an amount no less than the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor and Workforce Development. The undersigned bidder agrees to indemnify the Awarding Authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of (1) the failure of the said bid to be based upon the payment of the said applicable prevailing wage rates or (2) the failure of the bidder, if selected as the contractor, to pay laborers employed on the project the said applicable prevailing wage rates.

DATED: _____

NAME OF BIDDER: _____

BY: _____
(NAME)

THIS CERTIFICATION MUST BE COMPLETED AS A CONDITION OF CONTRACT EXECUTION

**TOWN OF WESTWOOD
CONTRACT & GENERAL CONDITIONS**

(Contract Number)

Date: May 28, 2020

This agreement is made under seal the _____ day of _____, 2020, between the Town of Westwood, acting through its Permanent Building Committee (the "Owner"), and _____ (the "Contractor"), of _____.

("Contractor")

(Mailing Address of the Contractor)

(Telephone)

(Fax)

(Website)

1. This is a Contract for the procurement of the following:

Construction of New Wentworth Hall Library

The Scope of Work: The Proposed Westwood Wentworth Hall Library will be located across the street from the existing branch at 280 Washington Street. The proposed design includes construction of a new wood framed library facility of approximately 8,135 sf. The first floor contains the major library spaces and functions, while the lower floor contains a conference / community meeting room, and office space for other Town departments including Youth and Family Services. The proposed design will relocate portions of the existing library facades, for use in the new library. The demolition, preparation, and relocation of these facades will be provided under this contract. The foundation, including damp proofing and partial backfill, for the new library has been designed and provided under a separate contract (refer to limits as indicated in the bid documents). Access to the existing CVS parking lot must always be available during construction. Site improvements will include the excavation, preparation, and installation of underground utilities, as well as partial furnish and install of site paving, parking, roadways, plantings, and other site improvements (refer to limits as indicated in the bid documents). The estimated project construction cost is approximately \$2,686,500 with a schedule of 9 months.

2. The Contract price to be paid to the Contractor by the **Town of Westwood** is:

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GENERAL CONDITIONS

ARTICLE 1: DEFINITIONS

CHANGE ORDER, a written amendment to the Contract Documents signed by the Owner and the Contractor making changes in the Work and/or making adjustments to the Contract Sum and/or Contract Time.

CONTRACT AMOUNT, CONTRACT SUM, AND CONTRACT PRICE shall all have the same meaning, and refer to the total amount paid to the Contractor for completion of the Work, subject to the various methods of adjustment defined in the Contract Documents.

CONSTRUCTION CHANGE DIRECTIVE, a Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by the Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted if and as appropriate.

CLERK OF THE WORKS, OPM or OWNERS PROJECT MANAGER shall mean Compass Project Management, Incorporated, the Owner's Project Manager.

CONTRACT, this agreement between the Owner and the Contractor to provide the construction services required pursuant to the Contract Documents.

CONTRACT DOCUMENTS, the Advertisement, Instructions to Bidders, General Bid Form of Contractor as accepted by Owner, Notice of Award, Contract For Construction Services and General Conditions, Supplementary General Conditions, Drawings, Plans and Specifications and all addenda issued by the Owner or its agent during the bidding period, Change Orders, Construction Change Directives, procedures and forms attached to the Contract, all of which constitute one instrument.

CONTRACTOR or GENERAL Contractor or a pronoun in place thereof, the party contracting to perform the construction services required by the Contract.

DESIGNER, or the "Architect", or Engineer shall mean McKay Architects, Inc., 35 Bryant St, Dedham, MA 02026, the design firm hired by the Owner to develop the plans and specifications for the Project and to provide services related to the administration of the construction contract.

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

GENERAL LAWS, the General Laws of the Commonwealth as amended, including any rules, regulations, and administrative procedures implementing said laws.

PROJECT, is the total construction of the Work performed under the Contract Documents and which may also include construction by the Owner or by separate contractors.

OWNER, The Town of Westwood acting by and through its Permanent Building Committee,

OWNER'S PROJECT MANAGER, shall mean Compass Project Management, Inc., appointed by the Owner to perform Owner's Project Manager Services pursuant to M.G.L. c. 149 Section 44 A1/2.

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

SUPERINTENDENT or SUPERVISOR, the person employed by the Contractor to be in attendance at the project site throughout the prosecution of construction services under the Contract.

WORK, means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

ARTICLE 2: DESCRIPTION OF WORK, INTERPRETATION, INTENT

1. The Contractor agrees to do and complete all the work and furnish all the materials required by the Contract Documents in a proper, thorough, and workmanlike manner, in accordance with the terms of the Contract and customary construction practice.
2. All plans, general and detailed, are to be deemed a part of the Contract, and the plans and specifications and Contract are to be considered together, and are intended to be mutually complementary, so that any work shown on the plans, though not specified in the specifications, and any work specified in the specifications, though not shown on the plans, is to be executed by the Contractor as a part of the Contract. Figured dimensions are to prevail over scale. All things which in the opinion of the Designer may reasonably be inferred from the Contract Documents are to be executed by the Contractor in accordance with the terms of the Contract. In the event of a conflict among or ambiguity in the Contract Documents, the Contractor is to assume that the Contract Documents require the greater quantity and better quality of work, and the Contractor shall immediately bring to the attention of the Designer the purported conflict or ambiguity, failing which the Contractor shall under no circumstances be eligible for an equitable adjustment in its favor in the Contract Sum or Contract Time.
3. The Contractor shall be responsible to the Owner for the acts and omissions of its subcontractors and suppliers and of all persons directly or indirectly employed by it in connection with the work required under the Contract.
4. The Table of Contents, titles, headings, and marginal notes or sub-scripts contained herein are solely to facilitate references and in no way affect or limit the interpretation of the provisions to which they refer.
5. 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, or the latest revision, to the extent legally applicable and approved by the Owner.
6. Where no explicit quality or standards for material 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.
7. 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.
8. The Contractor and all Subcontractors shall refer to all of the Drawings, including those showing primarily the Work of the structural, mechanical, electrical and other specialized trades, and to all of the Sections of the Specifications, and shall perform all the Work reasonably inferable therefrom as being necessary to produce the indicated results.
9. 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.
10. It is expressly understood and agreed that this contract is for a completed project, which the Contractor shall provide to the Owner, unless specifically excused therefrom by this agreement or a written authorization signed by the Owner.

ARTICLE 3: CONTROL OF WORK/ADMINISTRATION OF THE CONTRACT

1. Designer

Notwithstanding anything to the contrary expressed or implied in this Contract, any of the powers, rights, and duties of the Designer may be exercised by the Owner, provided that the Owner shall be under no obligation to do so. The Owner may rely on the Designer for the performance and exercise of certain rights and obligations of the Owner hereunder. The Owner may explicitly overrule in writing any action, determination or decision of the Designer should the Owner choose to do so, except to the extent that the same would violate applicable law. Subject to the foregoing, the Designer shall be responsible for the general administration of the Contract and shall perform the duties and exercise the rights herein conferred on the Designer. Except as otherwise specifically provided herein, the Designer shall decide all questions which may arise as to the conduct, quantity, quality, equality, acceptability, fitness, and rate of progress of the several kinds of work and materials to be performed and furnished under this Contract, and shall decide all questions which may arise as to the interpretation of the Plans and Specifications. In the case of the death, resignation, inability or refusal of the Designer to act, or the termination of his or her or its employment, the Owner may appoint another person to act as Designer for the purposes of this contract. The Owner shall give written notice to the Contractor of any such appointment.

2. Right of Access to Work.

The Owner, the Owner's Project Manager, and the Designer (and persons designated by them) may for any purpose enter upon the Work, the Site, and premises used by the Contractor and the Contractor shall provide safe facilities at the construction site. Other contractors of the Owner may also enter upon the construction site for the purposes of performing work required by their contracts with the Owner. Any differences or conflicts that may arise between the Contractor and other contractors of the Owner shall be initially resolved by the Owner's Project Manager.

3. Inspection No Waiver

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

ARTICLE 4: GENERAL PERFORMANCE OBLIGATIONS OF THE CONTRACTOR

In general, the Contractor shall:

1. Study All Contract Documents

Carefully study the Contract Documents and all components thereof, and any orders that shall be made and given as authorized in the Contract.

2. Dimensions

Before starting the work and at frequent intervals during the progress thereof, carefully compare all specifications, drawings, plans, orders, field conditions, information furnished by the Owner, drawings, all figures, dimensions, line marks, and scales, and all information provided by the Designer pursuant to Requests for Information, so there will be a clear understanding regarding the work to be performed under the Contract, and at once submit any and all questions and any discrepancies, conflicts or ambiguities to the Designer for review. If the Contractor proceeds with the work without such notice to the Designer, having discovered such discrepancies, etc., or if by reasonable study of the contract documents, the contractor should have discovered such discrepancies, etc., the contractor shall bear all costs arising therefrom.

3. Mechanical, Electrical, Plumbing and Fire Protection Drawings

The Mechanical, Electrical, Plumbing and Fire Protection Drawings are diagrammatic only, and are not intended to show the alignment, physical locations or configurations of such Work. Such work shall be installed without additional cost to the Owner to clear all obstructions, permit proper clearances for the work of other trades, and present an orderly appearance where exposed. Prior to beginning such work, the Contractor shall have prepared a submittal, for approval by the Designer, consisting of coordination drawings showing the exact alignment, physical location and configuration of the Mechanical, Electrical and Fire Protection installations demonstrating to the Contractor's satisfaction that the installations will comply with the preceding sentence. The Contractor shall be solely liable and responsible for any costs and/or delays resulting from the Contractor's failure to prepare such coordination drawings. Exact locations of fixtures and outlets shall be obtained from the Designer before the work is roughed in; work installed without such information from the Designer shall be relocated at the Contractor's expense.

4. Requests For Information

- (a) The Contractor may submit requests for information to the Designer to help facilitate the Contractor's performance of the Contract. Prior to submitting each request for information, the Contractor shall first carefully study and compare the Contract Documents, field conditions, other Owner-provided information, Contractor prepared Coordination Drawings, and prior Project Correspondence and documentation to determine that the information to be requested is not reasonably obtainable from such sources.
- (b) Each request for information shall be submitted to the Designer, in writing, in such form and with such accompanying information as the Designer may require for such purpose. Each request for information shall identify the specific sources which were reviewed by the Contractor in its efforts to determine the information requested, and a statement to the effect that the information being requested could not be determined from such sources.
- (c) The Contractor shall submit each request for information sufficiently in advance of the date by which such information is required in order to allow the Designer sufficient time, in the Designer's professional judgment, to permit adequate review and response and to permit Contractor compliance with the latest construction schedule.
- (d) The Contractor shall maintain a log at the Project site that sequentially numbers and lists each request for information. This log shall also contain the Drawing reference or Specification section to which the request pertains, the date of the request, to whom the request was made, by whom the request was made, the nature of the request,

and the resolution thereof. This log shall be reviewed at each Project meeting and the resolution of requests for information shall be made part of the minutes of such meetings.

5. Shop Drawings, Product Data and Samples

- (a) Shop Drawings are drawings, diagrams, schedules and other data specifically prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- (b) Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.
- (c) Samples are physical examples which illustrate materials, equipment and workmanship and establish standards by which the Work will be judged.
- (d) The Contractor shall review for compliance with the Contract Documents, approve and submit to the Designer Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor, and submittals which are made by the Contractor but not required by the Contract Documents, may be returned without action.
- (e) The Contractor shall provide a submittal schedule to the Owner's Project Manager and the Designer, which schedule shall include, for each submittal, a sufficient and reasonable review period in the Designer's professional judgment, prior to the Contractor's scheduled date for ordering, purchasing, fabricating, etc. the items that constitute the subject matter of the submittal.
- (f) By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals the Contractor thereby represents that the Contractor 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, Samples, or similar submittals and verification of compliance with all the requirements of the Contract Documents, including all requests for information and all responses from the Designer to requests for information. The accuracy of all such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, Samples, and similar submittals the Designer shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.
- (g) The Designer will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Designer's actions will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Designer's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Designer's review of the Contractor's submittals shall not relieve the Contractor of any obligations of the Contractor hereunder. The Designer's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences or procedures. The Designer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.
- (h) The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Designer. Such Work shall be in accordance with approved submittals and responses to requests for information.
- (i) The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Designer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Designer in writing of such deviation at the time of submittal and the Designer has given separate written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Designer's approval thereof.
- (j) The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Designer on previous submittals.
- (k) Informational submittals upon which the Designer is not expected to take responsive action may be so identified in the Contract Documents.
- (l) When professional certification of performance criteria of materials, systems or equipment is required by the Contract

Documents, the Designer shall be entitled to rely upon the accuracy and completeness of information furnished by the Contractor in connection with such criteria.

- (m) Contractor shall submit samples of colors and finishes of factory finished products and of colors and finishes of job-applied products in duplicate and greater quantities where indicated. Submit complete selection of color samples; partial submittals will not be accepted. Colors shall be selected by the Designer. All colors submitted shall match colors selected. Schedule submittals to facilitate final selection of colors of adjacent materials.
- (n) The Owner shall have the right to charge the Contractor for costs the Owner incurs to the Designer or its consultants if a submittal or shop drawing is reviewed and rejected by the Designer more than twice.

6. Notices, Permits, Conformance with Codes.

- (a) The Contractor shall give all notices, apply for and secure all permits, including the building permit, pay all charges, fees, water and other rates, give personal supervision to the work, keep a competent superintendent and a sufficient number of competent employees on the site until the completion of the work, carry on the work in accordance with the Contract Documents, with all proper speed and in accordance with the requirements of law and of all other public authorities, and furnish the Owner with such information and vouchers relative to the work, the materials therefor, and the persons employed thereon, as the Owner shall from time to time request.
- (b) If the Contractor observes that portions of the Contract Documents are at variance with applicable laws, statutes, ordinances, building codes, and rules and regulations, the Contractor shall promptly notify the Designer and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.
- (c) If the Contractor performs Work that it knows or should know is contrary to laws, statutes, ordinances, building codes, and rules and regulations without notice to the Designer and Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs.

7. Communications Facilitating Contract Administration

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Contractor shall communicate with the Owner through the Designer, with a copy to the OPM. Communications by and with the Designer's consultants shall be through the Designer. The Contractor shall direct any communications regarding the requirements of the contract documents or the acceptability of the work to the Designer. Notwithstanding the foregoing, the Contractor may also communicate directly with the OPM and Owner whenever requested to do so, in relation to matters that arise during the administration of construction, except for matters that involve the interpretation of the requirements of the Contract Documents. Communications by and with subcontractors and material suppliers shall be through the Contractor.

8. Site Layout, Registered Engineer, Survey

Retain a competent Registered Professional Engineer or Registered Land Surveyor to whom the Designer makes no objection, 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, easement, and other restrictive boundaries. The Contractor shall establish the building grades, lines, levels, column, wall and partition lines required by the various subcontractors in laying out their work.

9. Sheeting, Shoring, Bracing

Prevent, by sheeting and shoring or bracing, if necessary, any caving or bulging of the sides of any excavation made by the Contractor leaving sheeting and shoring in place, and if any is removed, fill solid the spaces left thereby.

10. De-Watering

Provide pumping, drainage, and disposal of all water and/or whatever flows in any conduit interfered with by the Contractor so that no puddle or nuisance will be caused by water or flood; protect the work from injury by water, frost, wind, fire, accident, or other cause.

11. Correction of Work

- (a) The Designer will have authority to reject Work that does not conform to the Contract Documents. Whenever the Designer considers it necessary or advisable, the Designer will have authority to require inspection or testing of the Work whether or not such Work is fabricated, installed, or completed. However, neither this authority of the Designer nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or

responsibility of the Designer to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

- (b) The Contractor shall promptly correct Work rejected by the Designer for failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting such rejected Work, including additional testing and inspections and compensation for the Designer's and project manager's services and expenses made necessary thereby, and any attorneys' fees incurred by the Owner. If the Contractor fails to promptly commence and diligently continue with the correction of Work rejected by the Designer within seven days of notice to the Contractor of such rejection, the Owner may correct the work itself by any means necessary, including by the use of other contractors, in which event the Owner shall be entitled to back charge the Contractor for all costs related to such corrections, including, without limitation, fees for Owner's designer and project manager, attorneys' fees, and all costs incurred to procure and solicit bids for corrective work under the bid laws of the Commonwealth of Massachusetts.

12. Sanitary Facilities

Unless otherwise provided in the Contract, provide and maintain buildings for the sanitary necessities of all persons employed on the work, including the Clerk of Work/ Owner's Representative, beginning with the first workman at the site as follows:

- (a) at approved locations near the work;
- (b) on the basis of not less than the number of units required by the standards of the "Occupational Safety and Health Act of 1970" (OSHA);
- (c) in a clean, sanitary condition at all times;
- (d) of an approved chemical or incinerator type, or water closets, if permitted (if an incinerator type, a sufficient number shall be provided to permit daily incineration of 33 1/3%); and
- (e) adequately screened to be inaccessible to flies.

13. Temporary Site Office

- (a) The Contractor shall erect temporary offices at the site of the work for its own use, in a location approved by the Owner, adequately furnished and maintained in a clean, orderly condition by the Contractor, provided that the cost of relocating the trailers or temporary offices shall be borne by the Contractor if the need so arises.

14. Telephone, Heat, Utilities

The Contractor shall provide, maintain, and pay for separate individual telephone and data service to the Contractor's field office. The Contractor shall be responsible for providing and paying for all temporary heat and utility costs associated with the construction of the Project until use and occupancy is achieved, at which time the Contractor and the Owner shall determine a fair and appropriate allocation for heat and utility costs incurred after use and occupancy.

15. Competent Workers; Superintendent

- (a) The Contractor shall employ only competent workers and whenever the Owner shall notify the Contractor, in writing, that any worker is, in its opinion, incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such employee shall be discharged from the work and shall not again be employed on the Project except with the consent of the Owner.

- (b) Duties and Qualifications of the Superintendent

The Superintendent shall be a competent and responsible employee, approved by the Owner, who is regularly employed by the Contractor and is designated by it as its representative to be in attendance at the Project site while work is on-going. The Superintendent shall be responsible for coordinating all the work of the Contractor and the subcontractors. The Superintendent shall be licensed consistent with the Massachusetts Building Code. The Superintendent's resume shall be submitted to the Owner prior to commencement of construction and must demonstrate to the Owner's reasonable satisfaction that the Superintendent has satisfactorily performed similar duties on construction projects that are similar in size and type to the Project.

16. Appropriate Conduct by Contractor and Subcontractors

Contractor agrees that its employees and agents shall conduct themselves while in the performance of the services under this contract in a professional and appropriate manner. No smoking will be permitted on the Project site. All members of the public, employees of the Owner and other vendors and their employees shall be treated with courtesy and respect.

Violations or contrary actions to this policy may result in contract suspension or termination or the need for the Contractor to replace the offending employee.

17. Subcontractors

The Contractor shall submit to the Designer a listing of the names and categories of work to be performed by subcontractors (other than filed subcontractors) for review and approval of the Owner prior to the subcontractor or sub-subcontractors performing services on the Project. Unless expressly waived by the Owner, all subcontractors employed on the project for any scope of work exceeding \$100,000 shall be obligated to provide a 100% performance and payment bond, from a Surety who is listed on the current U.S. Treasury List of acceptable sureties, naming the Owner as an additional Obligee under the bond. The Owner's review of such listing shall be limited to a check on the qualifications and responsibility of the subcontractor or sub-subcontractor proposed. Contractor agrees that any review and approval of any subcontractor by the Owner shall under no circumstances relieve the Contractor of its responsibility for all of its subcontractors, nor shall it operate as the Owner's approval in writing of a subcontractor for purposes of G.L. c. 30, § 39F. The Contractor shall require each 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 assumes toward the Owner and the Designer. Each subcontract agreement shall preserve and protect the rights of the Owner and the Designer under the Contract Documents, with respect to the work to be performed by the subcontractor and shall allow the subcontractor the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Filed subcontractors and the Contractor shall execute the statutory Form of subcontract found in G.L. c.149 §44F.

18. Safety Requirements

- (a) The Contractor shall take reasonable precautions for safety, of, and shall provide reasonable protection to prevent damage, injury or loss to:
 1. employees on the Work and other persons who may be affected thereby;
 2. the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the contractor's Subcontractors or Sub-subcontractors; and
 3. other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.
- (b) The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful order of public authorities bearing on safety of persons or property or their protection from damage, injury, or loss.
- (c) The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, 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 sites and utilities.
- (d) When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.
- (e) The Contractor shall promptly remedy damage and loss (other than damage or loss insured and repaired/replaced/remedied under property insurance required by the contract Documents) to property referred to in Clauses 17(a) 2 and 17(a)3 caused in whole or in part by the contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and/or responsible.
- (f) If the Contractor uses or stores toxic or hazardous substances it is subject to G.L. c. 111F, section 2, the "Right to Know" law and regulations promulgated by the Department of Public Health, 105 CMR 670, the Department of Environmental Quality Engineering, 310 CMR 33, and the Department of Labor and Industries, 441 CMR 21; and must post a Workplace Notice obtainable from the Department of Labor and Industries.
- (g) Compliance with Dig Safe Laws
 1. Dig-Safe is the Utility Underground Plant Damage Prevention System, 111 South Bedford Road, Burlington, Massachusetts 01803, 1-800-322-4844 or such office location established for said program or its successor.
 2. The Contractor must notify Dig-Safe of contemplated excavation, demolition, or explosive work in public or private ways, and in any utility company right of way or easement, by certified mail, with a copy to Department of Environmental Quality Engineering.

3. This notice must be given at least seventy-two (72) hours prior to the work, but not more than sixty (60) days before the work is to be done. Such notice shall set forth the name of the street or the route number of the way and an accurate description of the location and nature of the proposed work.
 4. Dig-Safe is required to respond to the notice within seventy-two (72) hours of receipt by designating the location of pipes, mains, wires, or conduits at the site. The Contractor shall not commence work until Dig-Safe has responded. The work shall be performed in such manner and with reasonable precautions taken to avoid damage to utilities under the surface at the work location.
 5. The Contractor shall provide the superintendent with current Dig-Safe regulations and a copy of G.L. c. 82, §40.
 6. Any costs related to the services performed by Dig-Safe shall be borne by the Contractor.
- (h) No blasting shall be permitted prior to the Contractor's submittal to the Designer and the Owner of a written certification that all proposed blasting has been properly permitted and shall be conducted in accordance with all applicable laws, regulations and codes; such written certification shall also list and include copies of all permits, licenses and approvals covered by the certification.
- (i) The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.
- (j) The Contractor shall at all times protect excavations, trenches, buildings and materials, from rain water, ground water, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.
- (k) The Contractor shall remove snow and ice which might result in damage or delay.
- (l) All employees to be employed at the worksite shall 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 he/she will comply fully with all laws and regulations applicable to awards made subject to M.G.L. c.149, §44A.
- (m) The successful bidder shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PS-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Acts (PL-91-54). The successful bidder shall have a competent person or persons, as required under Occupational Safety and Health Act, on the site to inspect the work and to supervise the conformance of the work within the regulations of the Act.
- (n) This project is subject to the Safety and Health Regulations of the U.S. Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (Industrial Bulletin No. 12)." Contractors shall be familiar with the 00100-9 requirements of these regulations.
- (o) This project is subject to the requirements set forth by the Commonwealth of Massachusetts' "COVID-19 guidelines and procedures for all construction sites and workers at all public work." The nature of the public health crisis, and the localized strategy to reduce spread and infection are changing rapidly. Current guidelines are available at the following website:

<https://www.mass.gov/covid-19-guidelines-and-procedures-for-all-construction-sites-and-workers-at-all-public-work>

Upon notice of award, the General Contractor will be required to submit for Owner approval, a site-specific Health and Safety risk analysis and COVID-19 safety plan (HASP). The General Contractor will be required to designate a site-specific COVID-19 Officer, and shall be responsible for certifying that the Contractor and all subcontractors are in full compliance with the COVID-19 Construction Guidance.

19. Methods, Means, Coordination, Cutting and Patching

- (a) The Contractor shall supervise and direct the work, using its best skill and attention, which shall not be less than that level of skill and attention necessary to ensure that the work is performed in no less than a workmanlike manner. It shall be solely responsible for all construction means, methods, techniques, and procedures and for coordinating all portions of the work under the Contract. If the Contract Documents give specific instructions concerning construction

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means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Designer and shall not proceed with the required means, methods, techniques, sequences or procedures unless otherwise directed in writing by the Owner.

- (b) The Contractor shall be responsible for the proper fitting of all work and the coordination of the operations of all trades, subcontractors, and materialmen engaged upon the work.
- (c) All necessary cutting, coring, drilling, grouting, and patching to fit together the several parts of the work shall be done by the Contractor or the sub-contractors, as per the specifications and directions of the Designer.
- (d) The Contractor shall not damage or endanger any portion of the Work or any fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.
- (e) The Contractor shall coordinate and supervise the work performed by subcontractors so that the work is carried out without conflict between trades and so that no trade, at any time, causes delay to the progress of the work. The Contractor and all subcontractors shall at all times afford each trade, any separate Contractor, and the Owner, every reasonable opportunity for the installation of work and the storage of materials, and the Contractor shall cooperate with the Owner during the delivery, moving and storage of the Owner's existing or new furnishings and equipment.

20. Debris, Cleaning Up

- (a) The Contractor shall not permit the accumulation of debris, both exterior and interior, and the work area shall at all times be kept satisfactorily clean. At completion of the work the Contractor shall remove from and about the project all waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials. Immediately prior to the Designer's observation for substantial completion, the Contractor shall completely clean the premises. Concrete and ceramic surfaces shall be cleaned and washed. Resilient coverings shall be cleaned, waxed and buffed. Woodwork shall be dusted and cleaned. Sash fixtures and equipment shall be thoroughly cleaned. Stains, spots, dust, marks and smears shall be removed from all surfaces. Hardware and all metal surfaces shall be cleaned and polished. Glass and plastic surfaces shall be thoroughly cleaned by professional window cleaners. All damaged, broken or scratched glass or plastic shall be replaced by the Contractor at the Contractor's expense. If the Contractor fails to clean-up as provided in the Contract Documents, to the satisfaction of the Owner, the Owner may do so and the cost thereof shall be charged to the Contractor.
- (b) The Contractor shall remove debris from the site of the work and dispose of it lawfully at any private or public dump that the Contractor may choose. The Contractor shall make all arrangements and obtain any approvals necessary from the owners or officials in charge of such dumps and shall bear all cost, including fees resulting from such disposal. Garbage shall be removed daily.
- (c) No open fire shall be permitted on site.
- (d) Chemical Waste

Chemical waste shall be stored in corrosion resistant containers, removed from the Project site, and disposed of not less frequently than monthly unless directed otherwise. Disposal of chemical waste shall be in accordance with law and standard established practices. Fueling and lubricating of vehicles and equipment shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants to be discarded or burned shall be disposed of in accordance with approved procedures meeting all applicable federal, state, and local laws and regulations. In the event of an oil or hazardous materials spill large enough to violate federal, state, or applicable local regulations, the Contractor shall notify the Owner and Designer immediately. The Contractor shall be responsible for immediately cleaning up any oil or hazardous waste spills resulting from its operations. Any costs incurred in cleaning up any such spills shall and incurred in connection therewith shall be borne solely by the Contractor.

21. Use of Site, Site Protection, Work Hours

- (a) 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 to enter and use the premises arises solely from the permission granted by

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the Owner under the Contract Documents. The Contractor shall confine the Contractor's apparatus, the storage of materials and the operations of the Contractor's workmen to the limits indicated by law, ordinances, permits, the Contract Documents and/or information provided by the Designer and the Contractor shall not unreasonably encumber the premises with the Contractor's materials. The Contractor shall provide the Owner and Architect access to the Work at all times.

- (b) The Contractor shall take precaution during the execution of work involving demolition not to disturb or damage any existing structures, landscaping, walks, roads, or other items scheduled to remain. The Contractor shall restore any damaged items to original condition and as directed by the Designer.
- (c) The Contractor shall provide and erect acceptable barricades, fences, signs, and other traffic devices to protect the work from traffic and the public.
- (d) Work Hours: Regular work hours for the construction project are Monday thru Friday 7:00 A.M. to 5:30 P.M., inclusive, provided that equipment shall not be started prior to 7:00 A.M. The Owner may allow work to be performed at times other than those listed. If the Contractor desires to carry on the Work outside of regular hours, or on Saturdays or holidays, the Contractor shall provide the Owner with 48 hours prior notice to allow satisfactory arrangements to be made for observing Work in progress, and the Contractor shall reimburse the Owner for the additional costs it incurs to monitor work performed outside of regular hours.

22. Weather Protection

The Contractor shall provide weather protection and provide adequate heat inside the building from November 1 to March 31, as required by G.L. c. 149, §§ 44F(1)(a) and 44G(D), to protect the materials and systems installed and prevent their deterioration.

23. Taxes

As a public project, the Contractor shall be entitled to exemptions from the state sales tax and the Owner will provide a tax exemption number. The Contractor shall pay all other employment, consumer, use and similar taxes for the project.

24. Owner's Right to Perform Construction and to Award Separate Contracts

- (a) The Owner reserves the right to perform construction or other operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site.
- (b) The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the work of the Contractor, who shall cooperate with them. Upon the request of the Owner, the Contractor shall participate with the Owner's separate contractors in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary to coordinate with the work of the Owner and its other contractors, after a joint review and mutual agreement. The agreed construction schedule shall then constitute the schedule to be used by the Contractor, separate contractors and the Owner until subsequently revised.
- (c) The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall coordinate its operations with the operations of the Owner and of any separate contractors.
- (d) The Contractor shall promptly remedy damage caused by the Contractor to completed or partially complete construction or to property of the Owner or separate contractors. 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, who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the Owner arises therefrom, the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court costs which the Owner has incurred.

ARTICLE 5: CONTROL OF MATERIALS ANDEQUIPMENT

1. Source of Materials

Materials and Equipment to be installed as part of the Contract (both or either of which are hereinafter referred to as "Materials") shall be new, unused, of recent manufacture, and assembled and used in accordance with the best construction practices.

2. "Or Equal" Clause

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Except where the Contract requires the use of a proprietary Material, the words "or equal" are understood to follow the name of any maker, vendor, or product specified to be used in the Contract Documents. To determine if Materials or articles proposed by the Contractor are equal to those specified, the Contractor shall provide to the Designer all information and samples the Designer shall reasonably require to determine whether the Materials or articles proposed are at least equal in quality, durability, appearance, strength, and design to the Material or articles named or described, and will perform at least equally the functions imposed by the design. See G.L. c.30, §39M (b).

3. Samples and Tests

- (a) After reasonable notice to the Contractor, the Designer may require testing of any Materials to be used in the work. Those materials may be tested or observed after reasonable notice by the Designer and may be rejected if they fail to comply with specified tests. Except as otherwise provided in the Contract, all testing of Material specifically requested by the Designer will be performed by testing companies and will be paid for by the Owner, except that the cost of testing of Materials that fail the testing criteria shall be borne by the Contractor. If the Contractor requests permission to use a Material that was not specified in the Contract Documents and the Designer requires testing of such Material before approving its use, the Contractor shall pay for such testing. 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 Designer, unless such substitution was made at the written request or direction of the Owner or the Designer.
- (b) The source of Material proposed by the Contractor shall be designated in time to permit all required testing and inspection before the Material is needed for incorporation into the work. The Contractor shall have no claim for delays or time extensions due to testing if it fails to designate the proposed source or to order the Material in time to provide for adequate testing and inspection. Necessary arrangements shall be made to permit the Designer to make factory, shop, or other observation of Materials or equipment ordered for the work, in process of manufacture or fabrication, or in storage elsewhere than the site of the work.
- (c) The Contractor shall furnish the Designer with samples of the Materials it proposes to use in the execution of the work in sufficient time to afford the Designer the opportunity to adequately review and, if necessary, arrange for testing of such Materials.

4. Deviations from Contract Requirements

The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Designer's approval of shop drawings, product data, samples or similar submittals unless the Contractor has specifically informed the Designer in writing of such deviation at the time of submittal and the Designer has given separate, written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in shop drawings, product data, samples or similar submittals by the Designer's approval thereof.

5. Delivery and Storage

- (a) Materials and equipment shall be progressively delivered to the site so that there will be neither delay in the progress of the work nor an undue accumulation of Materials that are not to be used within a reasonable time.
- (b) Materials stored off site shall be stored at the expense of the Contractor in a manner acceptable to the Owner that preserves their quality and fitness for the work. Material shall be placed on wooden platforms or other hard clean surfaces and not on the ground and shall be properly protected.
- (c) If the Contractor requests the Designer's observation of Materials stored outside of Massachusetts, the Contractor shall assume the Designer's reasonable costs for travel, room, and meals associated with such observation.
- (d) Materials stored either at the Project site or at some other location agreed upon in writing shall be located so as to facilitate prompt observation and may again be observed prior to their use in the work.
- (e) All storage sites shall be restored to their original condition by the Contractor at its expense.
- (f) The Contractor shall take charge of and be liable for any loss of or injury to the Materials delivered at or in the vicinity of the place where the work is being done; it shall notify the Designer as soon as any such materials are so delivered, and allow them to be examined by the Designer.

6. Payment for Stored Materials

The Contractor may request payment for stored materials, in accordance with the provisions of G.L. c. 30 Section 39K. The

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OPM/Owner's Representative will inspect all stored materials.

7. Rejection of Defective Materials

The Designer may reject Materials if it reasonably determines that such Materials do not conform to the Contract Documents. No rejected Materials, the defects of which have been subsequently corrected, shall be used in the work except with the written permission of the Designer. No extra time shall be allowed for completion of the work due to the rejection of non-conforming Materials.

8. Rejection of Defective Work

The Designer's review of the work shall not relieve the Contractor of any of its responsibilities to fulfill its Contract obligations and to correct defective work, all of which shall be corrected by the Contractor. Unsuitable work may be rejected by the Designer, notwithstanding that such work and Materials have been previously accepted for payment. If the work or any part thereof shall be found defective at any time before the final acceptance of the whole work, the Contractor shall forthwith correct such defect with promptness and diligence, and in a manner satisfactory to the Designer; and if any Material brought upon the site for use in the work, or selected for the same, shall be condemned by the Designer as unsuitable or not in conformity with the Contract requirements, the Contractor shall forthwith remove such Materials from the vicinity of the work. Nothing in the Contract shall be construed as vesting in the Contractor any right of property in the Materials used after they have been attached or affixed to the work or the soil; all such Materials shall, upon being so attached or affixed, become the property of the Owner. Approvals or determinations of acceptability of Materials by the Designer shall not in any way be construed to relieve the Contractor of its full responsibilities under the Contract.

9. Aesthetic Decisions

The Designer's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

ARTICLE 6: JOB MEETINGS, PROSECUTION AND PROGRESS, AND LIQUIDATED DAMAGES

1. Job Meetings

(a) Pre-Construction Conference

Prior to commencement of the work, the Contractor shall meet with representatives of the Owner and the Designer to discuss and develop mutual understandings relative to administration of the Contract and the frequency of job meetings.

(b) Job Meetings

The Contractor shall arrange for and attend weekly job meetings with the Designer, the Owner and such other persons as the Designer or the Owner may from time to time wish to have present. The Contractor shall be represented by a superintendent or other authorized representative. An authorized representative of any subcontractor or sub-subcontractor shall attend such meetings if the representative's presence is requested by the Designer. 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 served on such representatives.

(c) From time to time, the Owner may request that the Contractor attend the Permanent Building Committee's meetings to address particular issues of concern, in which event the Contractor's Project Manager shall attend, without additional cost to the Owner.

2. Contract Time, Schedules, Time Extensions

(a) The Contract Time commences immediately from the date that the executed copy of the Contract is mailed or presented to the Contractor. The Contractor shall begin work on the Project within ten (10) days of the date that a properly executed copy of the Contract is delivered to the Contractor, unless otherwise ordered in writing by the Owner. The Contractor shall proceed expeditiously with adequate forces and shall achieve substantial and final completion within the Contract Time. The Contractor shall carry out work on a continuous basis unless otherwise authorized by the Owner in writing.

(b) Prior to commencement of the work, the Contractor shall submit to the Designer and OPM a progress schedule in satisfactory form, showing in detail its proposed progress for the construction of the various parts of the work and the proposed times for receiving Materials required. The Progress Schedule shall be based on an orderly progression of

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the work, allowing adequate time for each operation (including adequate time for submission and review of submittals), and leading to a reasonable certainty of substantial and final completion by the date(s) established in the Agreement. The Progress Schedule will be reviewed by the Designer and Owner for compliance with the requirements of this Article. The Contractor shall, at the end of each month, or more often if required, furnish the Designer and Owner an updated schedule showing actual progress of the various parts of the work in comparison with the originally proposed progress schedule submitted to the Designer for its review and comment. If the Designer or the Owner's Representative raise any objections to progress schedules submitted by the Contractor, the Contractor shall immediately address and resolve such objections to their reasonable satisfaction. The raising or failure to raise any such objections shall not relieve the Contractor of its scheduling obligations hereunder. Contractor's schedules shall also comply with all other requirements of the Contract Documents relating to the Construction schedule.

- (c) Time is of the essence in the performance of work under the Contract. The work shall be substantially completed by the dates described in Section 4 of this Article. The Contractor may only be entitled to an extension of time to complete the work if the Contractor can demonstrate to the reasonable satisfaction of the Owner, upon the recommendation of the Designer, that the schedule for the Project has been adversely impacted by events that entitle the Contractor to a time extension, as provided in this Article, and that the Contractor cannot revise its schedule to eliminate the need for a time extension. Delays caused by suppliers, subcontractors, and sub-subcontractors shall be considered to be within the control of the Contractor. Should the Contractor require additional time to complete the work, it shall document its reasons therefor and request an extension of time at the time the alleged delay occurred, as provided in this Article and Article 7. Failure to notify the Owner of any delay as provided in this Article and strictly comply with all contract procedures for the making of claims shall preclude the Contractor from requesting and obtaining a time extension due to said delay. Requests for extensions of time shall be submitted as a Change Order request to the Owner under Article 7.
- (d) 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.
- (e) The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Designer on account of any delay in the commencement or performance of any of the work or any delay or suspension of any portion of the work, whether such delay is caused by the Owner, the Designer, or otherwise, except as and to the extent expressly provided under G.L. c. 30, sec. 39O, in the case of written orders by the Owner to suspend the work for Owner's convenience. The Contractor acknowledges that the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in this Article. The Contractor will under no circumstances be eligible for additional compensation on account of any delay even if an extension of time is granted by the Owner.
- (f) Change Order requests for an extension of time must be submitted no later than 14 calendar days from the date of the event giving rise to the claimed delay, and must be accompanied by a detailed analysis identifying each action(s) or additional work item(s) which caused the delay and also identifying exactly which items along the critical path were impacted or delayed. Accumulating the amount of time required to complete a series of additional work items or delays and adding this time to the original Contract Time will not be considered justification for an extension of time. In order to justify an extension of Contract Time, the Contractor must prove clearly and convincingly that the critical path for construction has been impacted by circumstances beyond the control of the Contractor and that the CPM schedule cannot be revised to eliminate the need for the requested time extension.

3. Substantial Completion, Final Completion

- (a) Substantial completion is the stage in the progress of the work when the work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the work for its intended use and only minor items amounting to less than 1 percent of the adjusted Contract Sum and which can be corrected or completed without any material interference with the Owner's use of the work remain to be corrected or completed.
- (b) When the Contractor considers that the work, or a portion thereof designated in the Contract Documents for separate completion, is substantially complete, the Contractor shall submit to the Designer a list of items to be completed or corrected, all special warranties and permits required by the Contract Documents, endorsed by the Contractor and in a form reasonably acceptable to the Designer. 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 Designer, on the basis of an observation, determines that the work or designated portion thereof is substantially complete and the other conditions have been met, the Designer will then prepare a Certificate of Substantial Completion which shall establish the date of substantial completion, and shall fix the time within which the Contractor shall complete the items listed therein. Contractor shall obtain an approved Certificate of Occupancy as a condition of achieving Substantial Completion. 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 Contractor.

- (c) The Designer will conduct observations to determine the date of Substantial Completion and the date of final completion will receive and forward to the Owner for the Owner's review and records written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for payment upon compliance with the requirements of the Contract Documents. The Owner may backcharge the Contractor for multiple visits by the Designer to review substantial or final completion and update the punch list, until there has been final acceptance by Owner.
- (d) The Owner shall be entitled to occupy all or a portion of the work upon the Designer's issuance of a Certificate of Substantial Completion covering the areas to be occupied.

4. Contract Completion Dates.

The Contractor shall substantially complete the entire Project by May 17, 2021, commencing on the date it receives the Notice to Proceed from the Owner (no later than September 1, 2020).

5. Phasing

Existing Wentworth Hall Demolition: The Contractor shall substantially complete all the work required to "panelize", relocate, and demolish the existing Wentworth Hall in accordance with the construction documents by November 2, 2020. Upon contract award, and no later than October 1, 2020, the Contractor shall notify the Owner in writing of their certification to complete this portion of the work by the date listed. Failure to comply with the notification and complete this portion of the work will be subject to liquidated damages as described in Article 6, Section 6, paragraph c.

6. Liquidated Damages

- (a) Since time is of the essence and since the amount of damage and loss to the Owner which will result from the Contractor's failure to turn the Project over to the Owner by the completion dates specified in the Contract will be difficult or impracticable to ascertain, the Contractor shall pay to the Owner the sum of \$1,000.00/day for each calendar day that the actual date of Substantial Completion exceeds the Contract date for Substantial Completion, as such completion date may be extended by an approved extension of time granted in a Change Order approved by the Owner pursuant to Article 6. Such moneys shall be paid as liquidated damages, not as a penalty, but to cover anticipated expenses to the Owner for continuing to monitor construction and administer the construction contract during the period of the delay in completion.
- (b) The assessment of liquidated damages or a portion thereof by the Owner may be waived in writing, in the sole discretion of the Owner.
- (c) The amount of damage and loss to the Owner which will result from the Contractor's failure to complete the portion of work described as "Existing Wentworth Hall Demolition" in accordance with the contract documents, and noted in Article 6, Section 5 have been estimated by a third party with a value of \$150,000.00. Should the Contractor fail to substantially complete this portion of the work by the dates specified, the Contractor shall pay to the Owner a sum of \$150,000.00 as liquidated damages, not as a penalty, but to cover anticipated expenses to the Owner for securing and completing the portion of work under separate contract

7. Delays

- (a) The Owner may delay the commencement of the work, or any part thereof, due to unforeseen circumstances or conditions which have a bearing on the work required under the Contract, or for any other reason, if it is deemed to be in the best interest of the Owner to do so. The Contractor shall have no claim for damages on account of such delay, but shall be entitled to so much additional time in which to complete the whole or any portion of the work required under the Contract as the Owner, upon recommendation of the Designer, shall reasonably determine is justified, pursuant to paragraph 2(c), above and subject to the provisions of the following subparagraphs (b) and (c).
- (b) Pursuant to G.L. c.30, § 390, the Owner may, for its convenience, order the Contractor in writing to suspend, delay, or

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interrupt all or any part of the work for such period of time as it may determine appropriate, provided however, that if there is a suspension, delay, or interruption for fifteen (15) days or more due to a failure of the Owner to act within the time specified in the Contract, the Owner shall make an adjustment in the Contract price for any increase in the cost of performance of the Contract but shall not include any profit to the Contractor on account of such increase; and provided further that the Owner shall not make any adjustment in the Contract Sum under this provision for any suspension, delay, interruption, or failure to act to the extent that such is due to any cause for which the Contract provides for an equitable adjustment of the Contract price under any other Contract provisions.

- (c) The Contractor must submit the amount of a claim made under subparagraph (b) to the Owner in writing within 10 business days 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 the Contract and, except for costs due to a written suspension order, the Owner shall not approve any costs in the claim incurred more than twenty (20) days before the Contractor notified the Owner in writing of the act or failure to act involved in the claim.
- (d) The Owner and the Contractor agree that they understand that the burden to make and substantiate claims to the satisfaction of the Owner, and to comply with all provisions of the Contract Documents and law to perfect such claims, is entirely upon the Contractor; and that failure of Contractor to fulfill that burden may deprive the Owner with the opportunity to take action to avoid or lessen the time extensions or delays that might be associated with such action or inaction, and any such failure shall, therefore, result in the permanent forfeiture and waiver of Contractor's claims.

8. Use and Occupancy

- (a) Upon request of the Owner, the Contractor shall, at no additional cost to the Owner, undertake reasonable efforts to provide the Owner with use and occupancy of the Project, or a portion thereof, before final completion, provided that the Owner is under no obligation to assume use and occupancy of all or a portion of the Project until the Contract is completed. In this regard, it is agreed and understood that the Owner, at its option, may occupy or use any completed or partially completed portion of the work at any stage in accordance with this section.
- (b) The Contractor shall not be responsible for wear and tear or damage resulting solely from temporary or early occupancy by the Owner, provided that any such wear, tear or damage is not caused, in whole or in part, by the Contractor or anyone for whom Contractor is responsible.
- (c) Use and occupancy of all or any part of the work prior to final acceptance does not relieve the Contractor from maintaining the required payment and performance bonds and insurance requirements under the Contract.

ARTICLE 7: CHANGES IN WORK

1. General

A Change Order request may originate with the Owner, the Designer, or the Contractor. Contractor's Change Order requests must be submitted to the Owner. The Change Order request must be made in writing on forms provided by the Designer and in accordance with the provisions of the Contract.

A Change Order request may be submitted for changes in the Contract work, including but not limited to, changes in: (a) the plans and specifications; and/or changes in (b) the schedule for performance of the work.

Whenever a Change Order is requested or ordered and said Change Order will cause an adjustment in the Contractor's cost, the Contractor may request an equitable adjustment in writing in the Contract price. Such request must be made in accordance with the provisions of the Contract Documents for the making of claims for such adjustments.

The Owner and the Contractor shall attempt to negotiate an equitable adjustment in the Contract price before commencement of the pertinent work, or as soon thereafter as possible. In the absence of an agreement for an equitable adjustment, the Contractor shall proceed to perform the work that is the subject of any Change Order request of the Owner and/or Construction Change Directive and shall keep detailed records on a time-and-material basis, as provided in paragraph 4 of this Article, and the Contractor will provide the Owner with such records as they are being made. Once the amount of a Change Order is agreed to between the Owner and the Contractor, the amount shall be considered full and final compensation to the Contractor for all the costs related to performing the work involved in the Change Order.

During the negotiation of an equitable adjustment in Contract price, the Contractor shall provide the Owner with all cost and pricing data used by him in computing the amount of the equitable adjustment, and the Contractor shall certify that the pricing data used was accurate, complete, and current. The Contractor shall promptly revise and resubmit such estimate if the Designer determines that it is not in compliance with the requirements of this Article, or that it contains errors of fact or mathematical errors. If required by the Designer, in order to establish the exact cost of new work added, or of work

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previously required but now omitted, the Contractor shall obtain and furnish to the Designer bona fide proposals from recognized suppliers for furnishing any material included in such work. Such estimates shall be furnished promptly so as to occasion no delay in the work, and shall be furnished at the Contractor's expense. The Contractor shall state in the estimate any extension of time required for the completion of the work if the change or extra work is ordered.

Statutory Contract adjustments made under the provisions of G.L. c.149 §44F shall not be considered a Change Order under this Article, and shall not entitle the Contractor to any adjustments for overhead, profit, and superintendent, although the Owner may, for administrative purposes, require that such Contract adjustments be processed on standard Change Order forms.

2. Computing Change Order Requests

Changes in the Contract price shall be determined according to one of the following methods, or a combination thereof, as determined by the Owner:

- (a) fixed price basis, provided that the fixed price shall be inclusive of items (i) through (vi) in subparagraph (c) (below) and shall be computed in accordance with those provisions;
- (b) estimated lump sum basis, to be adjusted in accordance with Contract unit prices, or other agreed upon unit prices provided that the unit prices shall be inclusive of all costs related to such equitable adjustment;
- (c) time and materials basis, on a not-to-exceed upset amount designated by the Owner to be subsequently adjusted on the basis of actual costs based on the following items (i) through (vi):
 - (i) the cost at prevailing rates for direct labor, material, and use of equipment (charges for small tools or "tools of the trade" shall not be computed in the amount of a Change Order request);
 - (ii) plus cost of Workmen's Compensation Insurance, union fringe benefits, federal unemployment taxes, Federal Social Security, and Massachusetts Unemployment Compensation, or, as an alternative the Contractor may elect to use a flat thirty (30) percent of the total labor rate in item (i);
 - (iii) plus fifteen (15) percent of item (i) for overhead, superintendence and profit and for all General Conditions, which will be paid to the Contractor for Item 1 work, which is the work of the Contractor and all its non-filed subcontractors. The Contractor and its non-filed subcontractors shall agree upon the distribution of the fifteen (15) percent as a matter of Contract between each other;
 - (iv) on Item 2 work, which is the work of filed subcontractors, ten (10) percent will be allowed to the filed subcontractor for overhead, superintendence and profit and the Contractor shall receive a five (5) percent markup for overhead, superintendence and profit and for all General Conditions on the cost of the work performed by the filed subcontractor; the filed subcontractor and its sub-subcontractors shall agree on the distribution of the ten (10)% as a matter of contract between one another.
 - (v) if the net amount of a change is an addition to the Contract price, the Contractor's overhead, superintendence, and profit shall be figured on the net amount of the change. On any change that involves a net credit, no allowances for overhead, superintendence, and profit shall be figured.
 - (vi) plus actual direct premium cost of payment and performance bonds required of the Contractor and its subcontractors, provided there will be an appropriate credit for bond premiums in the case of a credit Change Order.

3. Construction Change Directive

- a. A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.
- b. If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the methods listed in Paragraph 2, as determined appropriate by the Owner.
- c. Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Designer of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

4. Work Performed Under Protest

The Contractor shall perform all work as directed by the Owner. If the Owner determines that certain work for which the Contractor has requested a Change Order does not represent a change in the Contract, or if the Contractor and the Owner

cannot agree to the amount of compensation for a Change Order, the Contractor shall perform said work under protest and must follow the procedures described in the following subparagraphs (a) and (b):

- (a) If the Contractor claims compensation for a Change Order request not approved by the Owner, it shall, on or before the first working day following commencement of any such work or sustaining of any such cost, submit to the Owner a written claim which shall include a statement of the nature of such work, an explanation of why the Contractor deems the work to be extra work, and a detailed estimate of the cost of such work. The Contractor will not be entitled to compensation for any portion of its claim related to work performed prior to the Owner's receipt of such written claim.
- (b) In addition to the above, on or before the second (2nd) working day after the commencement of the work that is the subject of any written claim submitted by the Contractor in accordance with the above subparagraph, and daily thereafter, the Contractor shall file with the Designer itemized statements of the details and costs of such work performed calculated pursuant to paragraph 2(c) of this Article; and unless such statements shall be made as so required, its claim for such compensation shall be forfeited and invalid and it shall not be entitled to payment on account of any such work.

5. Deduction of Claims of the Owner

If the Contractor does not agree on the value of work that is deleted from the scope of the contract work, the assessment of liquidated damages by the Owner, the value of back charges the Owner has assessed against the Contractor for deficient, incomplete or unacceptable work, or the value of back charges the Owner has assessed against the Contractor for having others perform the Contractor's deficient, incomplete or unacceptable work, or back charges for the value of any other claims of the Owner, the Owner may deduct the cost of the same from amounts otherwise payable to the Contractor in the amount the Owner determines is appropriate.

6. Statutory Provisions - Differing Site Conditions; Timely Decisions

The Contractor's attention is directed to G.L. c. 30, §§ 39I, 39J, 39N, 39O, and 39P, the provisions of which apply to the Contract and are incorporated herein by reference.

- (a) The Differing Site Conditions Law, G.L. c.30, §39N, applies to this Contract.
- (b) The Timely decision Law, G.L. c.30, §39P, applies to this Project.

ARTICLE 8: PAYMENT PROVISIONS

1. Contract Amount

The Owner shall pay and the Contractor shall accept as full compensation for satisfactorily performing the work required by the Contract, the amount set forth on the Cover page of this contract.

2. Schedule of Values

Before the first Application for Payment, the Contractor shall submit to the Designer and OPM a detailed schedule of values allocated to various portions of the work, prepared in such form and supported by such data to substantiate its accuracy as the Designer may require and shall be revised if later found by the Designer to be inaccurate. This schedule, unless and until objected to by the Designer or the Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment. In general, payment items should be less than \$25,000.

3. Statutory Payment Provisions

The Contractor shall be entitled to payment from the Owner of the Contract amount, plus any approved additive Change Orders, less any approved deduct Change Orders, in accordance with the provisions of G.L. c. 30, §39K, which are incorporated by reference into this Contract.

4. Application for Payment.

The Contractor shall, once each month on the day of the month corresponding to the date of the Contract, or on a date mutually agreed to, on forms provided and in the manner prescribed by the Designer, submit to the Owner and its Designer, its Application for Payment showing the total amount of work done to the time of such application and the value thereof. It shall be the sole responsibility of the Contractor to deliver or cause to be delivered to the Owner and Designer said application in proper form and arithmetically correct. The Contractor shall arrange to deliver each application to the Owner and Designer at a scheduled weekly meeting. The Owner shall retain five (5) percent of such estimated value as part security for the fulfillment of the Contract by the Contractor and shall pay to the Contractor the balance not retained as aforesaid after deducting therefrom all previous payments and all sums to be kept under the provisions of the Contract.

5. Certificates for Payment

- (a) The Designer will, within seven days after the receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment for such amount as the Designer determines is properly due, and/or notify the Contractor and Owner in writing of the Designer's reasons for withholding certification in whole or in part.
- (b) The issuance of a Certificate for Payment will constitute a representation by the Designer to the Owner, based on the Designer's observations at the site and the data comprising the Application for Payment, that, to the best of the Designer's knowledge, information and belief, the Work has progressed to the point indicated in the application, and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion, and to specific qualifications expressed by the Designer. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Designer has (1) made exhaustive or continuous on-site observations to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) studied copies of requisitions received from Subcontractors and material suppliers and other data requested by the owner to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the contract Sum.

6. Payments to Certain Subcontractors

Filed subcontractors are entitled to payment from the Contractor as provided in the Subcontractors Payment Law, M.G.L. c. 30, §39F, which is incorporated by reference into this Contract.

7. Payment Liabilities of Contractor

- (a) The Contractor shall be responsible to the Owner for all expenses, losses and damages the Owner incurs in consequence of any defect, omission or mistake of the Contractor or its subcontractors or the making good thereof, including, but not limited to, the cost to correct defects and the costs incurred for services of the Designer and the Owner's Project Manager. In case the work required by the Contract shall not be completed by the time herein designated, as extended pursuant to the terms of the Contract, the Contractor shall pay to the Owner the sums specified in Article 5.
- (b) Retention of Moneys by the Owner

The Owner may retain any moneys which would otherwise be payable under the Contract and apply the same, or so much as may be necessary therefore, to the payment of any expenses, losses, or damages incurred by the Owner as a direct result of the Contractor's failure to perform its obligations hereunder including, but not limited to, the cost to correct defects, the costs incurred for services of the Designer, the Owner's Project Manager, separate contractors and the Owner's attorneys' fees.
- (c) No moneys retained under the provisions of this Article shall be held to be statutory security for the payment of claims filed in accordance with the provisions of M.G.L. c. 149, §29, for which security is provided by bond.

8. Acceptance of Final Payment

The acceptance by the Contractor of the last payment due under the Contract or the execution of the Certificate of Final Release and Acceptance, shall operate as a release to the Owner from all claims and liability related to the Contract, except for any claim listed by the Contractor against the Owner in such Certificate.

ARTICLE 9: TERMINATION

1. Termination For Cause

If the Contractor shall be adjudged bankrupt, or if he shall make a general assignment for the benefit of its creditors, or if a receiver shall be appointed of its property, or if the work to be done under the Contract shall be abandoned, or if the Contract or any part thereof shall be sublet without the previous written consent of the Owner, or if the Contract or any claim thereunder shall be assigned by the Contractor otherwise than as herein specified, or if at any time the Owner shall be of the opinion, and shall so state in writing, that the conditions herein specified as to the rate of progress of the work are not being fulfilled, or that the Contractor has violated any of the provisions of the Contract, the Owner may terminate the Contract and hold the Contractor and its sureties liable in damages, or the Owner may notify the Contractor to discontinue all work, or any part thereof, and thereupon the Contractor shall discontinue all work, or any part thereof, as the Owner may designate, and the Owner may

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thereupon complete the work, or any part thereof, and charge its expense of so completing the work or part thereof, including, but not limited to, the cost to correct defects, the costs incurred for services of an architect, project manager, separate contractors and attorneys' fees, to the Contractor, and the Owner may take possession of and use or cause to be used in the completion of the work or part thereof any materials, machinery, implements, and tools found upon the site of said work. The Owner shall not be liable for any depreciation, loss, or damage to said materials, machinery, implements, or tools during said use and the Contractor shall be solely responsible for their removal from the Project site after the Owner has no further use for them. The Owner shall not be liable for any depreciation, loss, or damage to said materials, machinery, implements, or tools during said use and the Contractor shall be solely responsible for their removal from the Project site after the Owner has no further use for them.

The Owner may, at its option, require the surety to complete the Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety shall be obligated, without duplication, for:

1. the responsibilities of the Contractor for correction of defective work and completion of the Contract;
2. additional legal, design professional and project manager costs incurred by the Owner as a result of the Contractor's default and during negotiations with the Surety to complete the Contract, and other costs the Owner incurs resulting from the actions or failure to act of the Surety; and
3. liquidated damages, or if no liquidated damages are specified in the Contract, actual damages for the delayed performance or non-performance of the Contractor.

2. Acceleration in Lieu of Termination

If, in the determination of the Owner, after consultation with the Designer, the Contractor fails to maintain the rate of progress required to complete the work on schedule due to causes within the Contractor's control, the Owner may, instead of notifying the Contractor to discontinue all work or any part thereof, notify the Contractor 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; and unless it shall, within five (5) days, after any such notice, increase its 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 condition as to the rate of progress shall, in the opinion of the Owner, be fulfilled, the Owner may employ and direct the labors of such additional force, equipment, and plant as may, in the opinion of the Owner, be necessary to ensure the completion of the work or such part thereof within the time herein specified, or at the earliest possible date thereafter, and charge the expense thereof to the Contractor. Neither the notice from the Owner to the Contractor to increase its force, equipment, or plant, nor the employment of additional force, equipment, or plant by the Owner shall be held to prevent a subsequent notice from the Owner to Contractor to discontinue work under provisions of the preceding paragraph, nor shall the Contractor be entitled for any costs of acceleration required to comply with this paragraph.

3. Termination Liabilities

All expenses charged under paragraphs (1) and (2) of this Article shall be deducted by the Owner out of any moneys then due or to become due the Contractor under the Contract; and in such accounting the Owner shall not be held to obtain the lowest figures, by competitive bid or otherwise, for the work of completing the Contract or any part thereof, or for insuring its proper completion, or for the additional force, equipment, and plant that may be employed, but all sums actually paid therefor shall be charged to the Contractor. In case the expenses charged, and any other expenses deducted for other reasons allowed in the Contract Documents and by law, are less than the sum which would have been payable under the Contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference, and in case such expenses shall exceed the said sum, the Contractor shall pay the amount of the excess to the Owner, upon completion of the work.

4. Termination - No Fault

The Owner may for convenience and without any cause terminate the contract without any liability to itself, in which event the Contractor shall be paid only for work satisfactorily performed to date and documented, approved expenses incurred to date less any offsets for costs, losses, damages, claims of the Owner and the like expenses incurred or expected to be incurred by the Owner, including attorneys' fees, said termination shall be made by written notice to the Contractor. In calculating the amount due the Contractor, Owner shall consider the construction expenses incurred by the Contractor calculated on a percent completion basis, covering the period of time between the last periodic payment and the date of termination. Contractor shall also be entitled to reasonable costs for demobilization. The foregoing compensation shall be

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considered to fully compensate the Contractor for all of its claims and expenses and those of its consultants, subcontractors, and suppliers, directly or indirectly attributable to the termination, and Contractor and its subcontractors shall not be entitled to lost profits.

5. Owner's Right to Terminate – Failure to Complete Punchlist

In accordance with M.G.L. c. 30, section 39K, any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the Contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the General Contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the Contract Completion Date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the Contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the Contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149.

6. Invalid Termination

Should there be a termination for cause which is later found or determined to have not been for cause, said termination shall be treated as a "Termination No-Fault" and payment shall be made as provided in said section 4, "Termination No-Fault", and, in such event, Contractor agrees that Owner shall not be liable for any alleged damages on account of any alleged wrongful termination. Said payment shall not operate in any event as a waiver of any rights or claims which the Owner may have against the Contractor or others.

ARTICLE 10: GUARANTEE

If any time during the period of one (1) year from the date of the use and occupancy of the work to be performed under the Contract any part of the work shall, in the reasonable determination of the Designer or the Owner, require replacing or repairing due to the fact that it is broken, defective, or otherwise does not conform to the Contract Documents, the Owner will notify the Contractor to make the required repairs or replacement. If the Contractor shall neglect to commence such repairs or replacements to the satisfaction of the Owner within ten (10) days from the date of the giving or mailing such notice, then the Owner may employ other persons to make such repairs or replacements. The Contractor agrees, upon demand, to pay to the Owner all amounts which the Owner expends for such repairs or replacements including, but not limited to, the cost to correct defects, the costs incurred for services of an architect, project manager, separate contractors and attorneys' fees. During this one (1) year guarantee period any corrective work shall be performed in accordance with the applicable terms of the Contract. For items of work completed after use and occupancy has been taken, the one (1) year guarantee shall commence at the time the Owner accepts such items. This one (1) year guarantee shall not limit any express guarantee or warranty provided elsewhere in the Contract.

ARTICLE 11: MISCELLANEOUS LEGAL REQUIREMENTS AND OTHER TERMS AND CONDITIONS

1. General

The Contractor shall keep itself fully informed of all existing and future state and national laws and municipal bylaws/ordinances and regulations in any manner affecting those engaged or employed in the work, or the materials used or employed in the work, or in any way affecting the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the Contract work. All provisions of law that apply to the Contract are made a part of the Contract, whether incorporated into the Contract or not. If any discrepancy or inconsistency is discovered in the Contract Documents in relation to any such law, ordinance, regulation, order, or decree, the Contractor shall forthwith report the same to the Owner in writing. It shall cause all its agents and employees to observe and comply with all such existing and future laws, ordinances, regulations, orders, and decrees.

2. Corporate Disclosures and Acknowledgments and Assurances

The Contractor, if a foreign corporation, shall comply with M.G.L. c. 181, §3 and 5, and c. 30, §39L.

3. Veterans Preference

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In the employment of mechanics and apprentices, teamsters, chauffeurs, and laborers in the construction of public works in the Commonwealth, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six (6) months at the commencement of their employment and who are veterans, as defined in M.G.L. c. 4, §7, clause 43, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six (6) months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States.

4. Prevailing Wage Rates and OSHA 10 Hour Certificate

The Commissioner of Labor and Industries has established the attached schedule of the prevailing minimum wage rates (the "Schedule") that must be paid to all workers employed on the Contract. The Schedule shall continue to be the minimum rate of wages payable to workers on the Contract throughout the term of the Contract. The Contractor shall not have any claim for extra compensation from the Owner if the actual wages paid to employees on the Contract exceeds the rates listed on the Schedule. The Contractor shall cause a copy of the Schedule to be kept in a conspicuous place at the Project site during the term of the Contract (see G.L. c. 149, §27). If reserve police officers are employed by the Contractor, they shall be paid the prevailing wage of regular police officers (see G.L. c. 149, §34B).

Each employee on the worksite shall successfully complete a course in construction safety and health approved by OSHA of at least 10 hours before they work on the Project. The Contractor and its subcontractors shall furnish documentation to the Owner confirming that each employee has the required OSHA Certificate, prior to the submission of the first certified payroll report that applies to each such employee. (See G.L. c. 149 Sect. 44E).

5. Employment Records

The Contractor and its subcontractors shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs, and laborers employed on the Project, showing the name, address, and occupational classification of each such employee, and shall furnish to the Attorney General, upon his request, a certified copy of such payroll records, signed by the employer or its authorized agent under the penalties of perjury. Each such Contractor and subcontractor shall preserve its payroll records for a period of three (3) years from the date of completion of the Contract.

Each subcontractor and the General Contractor shall submit weekly payroll records to the Owner, via the OPM, covering the persons who were employed on the Project during the preceding week.

STATEMENT OF COMPLIANCE

I, _____ (Name of Signatory Party), _____ (Title), do hereby state that I pay or supervise the payment of the persons employed by _____ (Contractor or Subcontractor) on the _____ (Building or Project) and that all mechanics and apprentices, teamsters, chauffeurs, and laborers employed on said project have been paid in accordance with wages determined under the provisions of G.L. c. 149, §26 and 27.

Signature: _____

Title: _____

The above mentioned copies of payroll records and statement of compliance shall be available for inspection by any interested party filing a written request to the Contractor for such inspections (G.L. c.149, §27B).

6. Vehicle And Equipment Operators

If the Commissioner of Labor and Industries has established a Schedule of wage rates to be paid to the operators of trucks, vehicles, or equipment for this Project, the Contractor shall be obligated to pay such operators the minimum wage rate contained on such Schedule (see G.L. c. 149, §27F).

7. Certificate of Appropriation. (Statutory reference: M.G.L. c.44, §31C).

This paragraph 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. c.44, §31C.

This Contract shall not be deemed to have been made until the Town accountant or other officer of the city or town having similar duties has certified thereon that an appropriation in the amount of this Contract is available 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, whether in the form of a drawing, plan, detail, or any other written instruction, unless it is an order which the Contractor is willing to perform without any increase in the Contract price, shall be deemed to be given until the Town accountant, or other officer of the awarding authority having similar duties, has certified thereon that an appropriation in the amount of such order is available therefore; but such certificate shall not be construed as an admission by the awarding authority of its liability to pay for such work. The certificate of the Town accountant or other officer of the awarding authority having similar duties, that an appropriation in the amount of this Contract, or in the amount of such order, is available shall bar any defense by the awarding authority on the grounds of insufficient appropriation.

8. Captions and Headings and Formatting

The used herein are used for convenience only and shall not affect the interpretation of any clause hereunder.

9. Non-Waiver

The failure of the Owner to insist on strict compliance of any term or condition of the Contract or Contract Documents shall not constitute a waiver of the Owner to do so thereafter or shall it constitute a waiver of any rights or remedies of the Owner.

10. Terms Required by Law

All terms required by law to be included in this Contract are hereby included and shall be in as full effect as if set forth in full herein.

11. Independent Contractor

Contractor is not an agent or employee of the Owner and is not authorized to act on behalf of the Owner. Contractor is not entitled to any benefits or privileges of the Owner's employees by reason of this agreement.

12. Complete Agreement

This Agreement supersedes all prior agreements and understanding between the parties and may not be changed unless mutually agreed upon in writing by both parties.

13. Assignment

Contractor shall not assign this Agreement or any interests therein, without prior written consent of the Owner.

14. Governing Law

This Agreement shall be governed by the law of the Commonwealth of Massachusetts, and any disputes arising hereunder shall be instituted in a Massachusetts state court in Plymouth County, to whose jurisdiction the Contractor hereby assents.

15. Enforceability

In the event any provision of this Agreement is found to be legally unenforceable, such unenforceability shall not prevent enforcement of any other provision of the Agreement.

16. Personal Liability

No member, employee, official, office, agent, staff or consultant of the Owner shall be under any personal obligation or liability by reason of this contract, the execution thereof or anything relating thereto.

ARTICLE 12: CONTRACTOR'S ACCOUNTING REQUIREMENTS

1. The provisions of G.L. c.30, § 39R, which require the Contractor to maintain statutorily required accounting standards, apply to this Contract and are incorporated by reference.

ARTICLE 13: INSURANCE REQUIREMENTS

1. Insurance Generally.

- A. The Contractor shall purchase and maintain insurance of the type and limits listed in this Article with respect to the operations as well as the completed operations of this Contract. This insurance shall be provided at the Contractor's expense and shall be in full force and effect for the full term of the Contract or for such longer period as this Article requires.
- B. All policies shall be written on an occurrence basis and be issued by companies lawfully authorized to write that type of

insurance under the laws of the Commonwealth with a financial strength rating of A- or better as assigned by AM Best Company, or an equivalent rating assigned by a similar rating agency acceptable to the Owner, or as otherwise acceptable to the Owner.

- C. The Contractor shall submit three originals of each certificate of insurance, acceptable to the Owner, simultaneously with the execution of this Contract.
- D. Owner, Designer and Owner's Project Manager shall be named as an Additional Insured and so stated on Contractor's Commercial General Liability, Vehicle Liability, Builder's Risk and Umbrella Liability Certificates of Insurance.

2. Contractor's Commercial General Liability.

- A. The Contractor shall purchase and maintain general liability coverage on the ISO form CG 00 01 or equivalent, including products and completed operations, on an occurrence basis. The form must be amended to state that the aggregate limit applies on a per location/project basis. The policy shall provide the following minimum coverage to protect the Contractor from claims with respect to the operations performed by Contractor and any employee, subcontractor, or supplier, or by anyone for whose acts they may be liable unless a higher coverage is specified in Section 8 below in which case the Contractor shall provide the additional coverage:

Bodily Injury &	\$1,000,000 each occurrence
Property Damage	\$2,000,000 general aggregate per project

3. Motor Vehicle Liability.

- A. The Contractor shall purchase and maintain the following minimum coverage with respect to the operations of any owned, non-owned, and hired vehicles including trailers used in the performance of the work, unless a higher coverage is specified in Section 8 below in which case the Contractor shall provide the additional coverage:

Bodily Injury & Property Damage	\$1,000,000 combined single limit
---------------------------------	-----------------------------------

4. Worker's Compensation.

- A. The Contractor shall provide the following coverage in accordance with M.G.L. c.149 §34A and c.152, as amended, unless a higher coverage is specified in Section 8 below, in which case the Contractor shall provide the higher coverage:

Worker's Compensation	Statutory limits
Employer's Liability	\$ 500,000 each accident
	\$ 500,000 disease per employee
	\$ 500,000 disease policy aggregate

5. Builder's Risk/Stored Materials

- A. The Contractor shall purchase and maintain Builder's Risk Insurance coverage against loss or damage on all Work included in this Contract in an amount equal to the Contract Amount. Such coverage shall be written on all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or damage including without duplication of coverage, theft, vandalism, malicious mischief, terrorism ("certified" and "non-certified"), collapse, earthquake, flood (if the project is not in an "A" or "V" flood Zone), windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's, Project Manager's and Contractor's services and expenses required as a result of such insured loss. Unless otherwise specified in this Contract, the limits for earthquake and flood shall be the lesser of the Contract Price or \$10,000,000. The policy shall include transportation and Stored Materials coverage in an amount equal to the value of the stored materials as required in B. below.
- B. The Contractor shall maintain insurance on delivered and/or stored material designated to be incorporated in the Work against fire, theft or other hazards. Any loss or damage of whatever nature to such material while stored at an off Site location shall be forthwith replaced by the Contractor at no expense to the Owner.
- C. The policy or policies shall specifically state that they are for the benefit of and payable to the Owner, the Contractor, and all persons furnishing labor or labor and materials for the Contract Work, as their interests may appear. The policy or policies shall list the Owner, the Contractor, and Subcontractors of any tier as named insureds.

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- D. Coverage shall include any costs for work performed by the Designer or any consultant as the result of a loss experienced during the term of this Contract.
- E. Coverage shall allow for the Owner's temporary occupancy and shall include a Waiver of Subrogation in favor of the Owner.
- F. Coverage shall be maintained until final acceptance by the Owner of the Work.
- G. A loss under the property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor as fiduciary for the insureds. The Contractor shall pay the subcontractors their just shares of insurance proceeds received by the Contractor and shall require subcontractors to make payments to their sub-subcontractors in similar manner.

6. Umbrella Coverage

The Contractor shall provide Umbrella Coverage in a form at least as broad as primary coverages required by Sections 2, 3 and 5 of this Article in the following amount: \$10,000,000

ARTICLE 14: INDEMNIFICATION

The Contractor shall assume the defense of, and indemnify and save harmless, the Owner, the OPM, the Designer and its consultants, and their officers and agents from all damages, liabilities, loss and expense, including, without limitation, attorneys' fees arising from the activities of the Contractor hereunder, and from all claims relating to labor performed or furnished and materials used or employed for the work; to inventions, patents and patent rights used in and in doing the work unless such patent infringement is due to a product or process specified by the Owner; to injuries to any person or corporation received or sustained by or from the Contractor and its employees, and subcontractors and employees, in doing the work, or in consequence of any improper materials, implements or labor used or employed therein; and to any act, omission or neglect of the Contractor and its employees therein. Contractor shall ensure that all subcontractors are similarly bound to the Owner as provided for in this Article. The indemnification obligations of this article are in addition to, and not a limitation of, any other right or remedy available to the Owner under the Contract Documents and at law or in equity, and are binding on the Contractor notwithstanding any insurance requirements, and no insurance provision shall excuse any indemnification requirement.

ARTICLE 15: PERFORMANCE AND PAYMENT BONDS

The Contractor shall provide the Owner with a performance bond and a labor and materials or payment bond executed by a surety company licensed by the Division of Insurance and approved by the Owner, in the forms attached and identified as Attachments A and B for the full and faithful performance of this contract. Each such bond shall be in the amount of the Contract price.

ARTICLE 16: SIGNATURES

IN WITNESS WHEREOF, the Owner and the Contractor have caused the Contract to be executed by their respective authorized officers.

OWNER

Town of Westwood
 By its Permanent Building Committee

CONTRACTOR

By _____

 Name
 Position

Date: _____

[Complete Attached Certificate Of Corporate Vote]

Date: _____

In accordance with M.G.L. C.44, Section 31C, this is to certify that an appropriation in the amount of this contract is available therefor.

TOWN FINANCE OFFICIAL

Account Number:

PO Number:

In accordance with M.G.L. C.44, this is to approve contract form.

TOWN COUNSEL

CERTIFICATE OF CORPORATE VOTE

If the Contractor is a corporation, complete the following certification:

At a duly authorized meeting of the Board of Directors of the _____
(Name of the Corporation) held on _____ (Date), at which all the Directors were present or waived notice, it was
voted that, _____ (Name), _____ (Officer) of this company, is authorized to
execute Contracts and bonds in the name and behalf of said company, and affix its corporate seal thereto, and such execution of
any Contract or obligation in this company's name on its behalf by such _____ (Officer) of the company,
shall be valid and binding upon this company.

I hereby certify that I am the Clerk of the _____ (Name of the Corporation), that
_____ (Name) is the duly elected _____ (Officer) of
said company, and that the above vote has not been amended or rescinded and remains in full force and effect as of the date of
the Contract.

A true copy,

Attest: _____

(Clerk)

Place of Business: _____

Corporate Seal:

STATE TAX CERTIFICATE

Pursuant to G.L. c. 62C, §49A, I certify under the penalties of perjury that the Contractor, to my best knowledge and belief, has filed all state tax returns and paid all state taxes required under law.

Social Security Number
or Federal Identification Number

Signature of Individual or
Corporate Name

By: _____
Corporate Officer
(if applicable)

TABLE OF ATTACHMENTS

- A Performance Bond
- B Labor and Material Payment Bond
- C Department of Labor and Industries Prevailing Wage Rates

ATTACHMENT "A" – PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That we _____ (Name of Contractor), a _____
(Corporation, Partnership, Joint Venture or Individual)

hereinafter called "Principal" and _____
hereinafter called the "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the Owner, in the penal sum of _____ Dollars (\$ _____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas the Principal has entered into a certain contract with the Owner (the "Construction Contract"), dated the _____ day of _____, 20____, for the construction described as follows:

_____.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of the Construction Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under the Construction Contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this obligation shall remain in full force and effect.

In the event that the contract is abandoned by the Contractor or is terminated by the Owner, said surety hereby further agrees that said surety shall, if requested in writing by the Owner, take such action as is necessary to complete said contract.

IN WITNESS WHEREOF, this instrument is executed in _____ () counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20____.

ATTEST:

(Principal Secretary) By _____
Principal

(SEAL) _____
(Address-Zip Code)

Witness as to Principal

(Address-Zip Code)

ATTEST:

By _____
Surety
(Attorney-in-Fact)

(Address-Zip Code)

(SEAL)

Witness as to Surety

(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF PERFORMANCE BOND

ATTACHMENT "B" – LABOR AND MATERIALS PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that _____
as principal, and _____
as surety, are held and firmly bound unto the Owner in the sum of _____

_____ lawful money of the United States of America, to be paid to the Owner, for which payment, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said principal has made a contract with the Owner under date of _____, 20_.

for: _____

Now the condition of this obligation is such that if the principal shall promptly pay for all labor performed or furnished and for all materials used or employed in said contract and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said contract that may hereafter be made, notice to the surety of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purposes of items set out in, and to be subject to, the provision of Massachusetts General Laws (Ter. Ed.), Chapter 30, Section 39A, and Chapter 149, Section 29 as amended, then this obligation shall become null and void; otherwise it shall remain in full force and effect.

In witness whereof we hereunto set our hands and seals this _____ day of _____, 20_.

By Principal: _____ [Seal]

By Surety: _____

Address: _____

Surety Agent: _____ [Seal]

Address: _____

Telephone: _____

**CERTIFICATE AS TO CORPORATE PRINCIPAL
(LABOR AND MATERIAL BOND)**

I, _____, certify that I am the _____
of the corporation named as principal in the within bond; that _____
who signed said Bond on behalf of the Principal was then _____
of said corporation and I know his signature and his signature thereon is genuine; and that said Bond was duly signed, sealed
and attested for and on behalf of said corporation by authority of its governing body.

Signed: _____ [Seal]

Date: _____, 20__

END OF LABOR AND MATERIAL PAYMENT BOND

FORM OF SUBCONTRACT

THIS AGREEMENT made this _____ day of _____, 20____, by and between _____ a corporation organized and existing under the laws of _____ a partnership consisting of _____ an individual doing business as _____

Hereinafter called the "Contractor" and _____ a corporation organized and existing under the laws of _____ a partnership consisting of _____ an individual doing business as _____ hereinafter called the "Subcontractor".

WITNESSETH that the Contractor and the Subcontractor for the consideration hereafter named, agree as follows:

1. The Subcontractor agrees to furnish all labor and materials required for the completion of all work specified in Section No. _____ of the Specifications for _____ (Sub-Trade) and the plans referred to therein and Addenda No(s) _____ for the Westwood Wentworth Hall Expansion project, all as prepared by McKay Architects Inc., for the sum of _____ dollars (\$ _____), and the Contractor agrees to pay the Subcontractor said sum for said work. This price includes the following alternates (and other items set forth in the sub-bid): Alternate No(s) _____ and _____.
 - (a) The Subcontractor agrees to be bound to the Contractor by the terms of the Contract Documents (including Addenda No. _____ and _____), and to assume to the Contractor all the obligations and responsibilities that the Contractor by those documents assumes to the Owner, hereinafter call the "Awarding Authority" except to the extent that 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 document 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.
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 the 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.

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 _____

SECTION 00 60 00

PREVAILING WAGE RATE SCHEDULE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Attached summary of prevailing wage rates consisting of (37) pages issued by the Commonwealth of Massachusetts Division of Occupational Safety and dated 12 January 2016.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PAYMENT OF PREVAILING WAGES

- A. Prevailing Wages listed shall be paid to all contractors' field employees during the construction of the project in accordance with the General Conditions of the Contract and Massachusetts General Law chapter 149, sections 26 - 27H.
- B. The General Contractor shall obtain from the Owner an updated Wage Rate schedule every 12 months for construction projects lasting longer than one year.
- C. The General Contractor and all subcontractors are required to anticipate the annual increase in wage rates with their bids, and shall not be entitled to claim any additional compensation for base contract work due to updated prevailing wage rate schedules.

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: New Wentworth Hall.
- B. Owner's Name: Town of Westwood.
- C. Architect's Name: McKay Architects.
- D. The Proposed New Wentworth Hall will be located at 273 Washington Street in the Islington section of Westwood, MA. Currently located on the site is a foundation to which was awarded under separate contract to support the new building and relocated Wentworth Hall wall panels. The proposed design includes construction of a new Library, Youth and Family Services Office and under alternates the finishing of a multi purpose space in the basement.
- E. The proposed design utilizes wall panels from the original Wentworth Hall located at 280 Washington Street. Complete demolition of the remainder of Wentworth Hall as per drawings and existing conditions is included in the work. Hazardous materials have been removed. Excavation of the new Wentworth Hall site and the majority of the foundation have been installed. Work includes completion of backfill at the foundation .

1.02 CONTRACT DESCRIPTION

- A. Contract type: General Construction Contract with Filed Sub Bids as defined by Massachusetts General Law Chapter 149, Sections 44A - 44H.

1.03 PREVAILING WAGES

- A. Pursuant to M.G.L. c.149, s.2726-27H, Massachusetts Prevailing Wages are applicable to this project, and shall be paid to all contractors' field labor. Refer to requirements in General Conditions.

1.04 PRODUCT/ ASSEMBLY/ SYSTEM SUBSTITUTIONS

- A. Where the Bid Documents stipulate particular acceptable products, the contractor is encouraged to utilize one of the products listed. In accordance with MGL Chapter 30, § 39M, products of other manufacturers not listed in the specifications shall be submitted as Substitutions with accompanying comparison to specified product, and will be evaluated by the Awarding Authority for equality to the specified product. The submitting contractor shall prepare sufficient data to enable review and comparison of submitted products for conformance to specification requirements, and comparison to listed products in terms of construction, quality, strength, performance, durability, and/or appearance. Allow for thirty (30) days review time for Substitution Requests. The Awarding Authority shall make final determination of acceptance. Refer to Section 01 60 00 PRODUCT REQUIREMENTS for submittal requirements and evaluation form to be completed for each such product request.
- B. Where the Bid Documents stipulate a particular product with a designation as a "Proprietary Product" the Awarding Authority has undertaken an evaluation of the specified product and competing products, and determined that use of the specified product is of specific benefit and in the best interest of the project, and has been voted as proprietary by the Awarding Authority. This indicates the strongest possible preference for the contractor or subcontractors to utilize the specified product, however in accordance with MGL Chapter 30, §39M, the Awarding Authority will evaluate products of other manufacturers for equality to the specified product. . The submitting contractor shall prepare sufficient data to enable review and comparison of submitted products for conformance to specification requirements, and comparison to listed products in terms of construction, quality, performance, strength, durability, and/or appearance. The Awarding Authority shall make final determination of acceptance.

1.05 PROPRIETARY PRODUCTS

- A. The following products have been evaluated and designated through a formal vote by the Awarding Authority to be beneficial to the project and public interest. As such they have been designated as "Proprietary", and the contractor shall utilize the specified products, or submit a Substitution Request form with supporting literature per PRODUCT / ASSEMBLY / SYSTEM SUBSTITUTIONS above and per Section 01 60 00 - Product Requirements. Final determination of product equality and acceptance for use on the project will be at the sole discretion of the

Awarding Authority.

B. Proprietary products include the following: NONE

1.06 PROJECT FEES AND BACKCHARGES

- A. The cost for sewer permits, and other permits not listed below as paid by subcontractors, shall be paid by the General Contractor. There is no cost for the General Building Permits
- B. The cost for other construction permits, including Elevator, Fire Protection, Plumbing, HVAC, and Electrical permits shall be paid by the respective subcontractor for each category of work.
- C. Utility company backcharges related to permanent service will be paid by the Owner.
- D. Utility company backcharges related to temporary power shall be paid by the Electrical Subcontractor.

1.07 OSHA REQUIREMENTS

- A. Pursuant to M.G.L. C. 30, SEC. 39S (A)(2), all employees to be employed on the project site shall have successfully completed a course in construction safety and health approved by OSHA and of at least 10 hours in duration.

1.08 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion.

1.09 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.10 CONTRACTOR USE OF SITE AND PREMISES

- A. The Town will not be obligated to turn over the site to the General Contractor until July 15 , 2020. The General Contractor may perform non-site related engineering and coordination prior to July 15, 2020.
- B. Construction Operations: Limited to areas noted on Drawings.
- C. Provide access to and from site as required by local authorities and by Owner:
- D. Do not obstruct roadways, sidewalks, or other public ways without permit.
- E. Existing building spaces may not be used for storage.

1.11 COORDINATION WITH TOWN'S OTHER CONCURRENT PROJECTS

- A. None

1.12 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

- A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.
- B. Section 01 20 00 - Price and Payment Procedures.
- C. Section 01 22 00 - Unit Prices.
- D. Section 01 30 00 - Administrative Requirements.
- E. Section 01 31 14 - Coordination.
- F. Section 01 31 15.02 - Terms of Use of Digital Drawings and Electronic Data.
- G. Section 01 32 16 - Construction Progress Schedule.
- H. Section 01 40 00 - Quality Requirements.
- I. Section 01 50 00 - Temporary Facilities and Controls.
- J. Section 01 51 00 - Temporary Utilities.
- K. Section 01 52 13 - Field Offices and Sheds.
- L. Section 01 60 00 - Product Requirements.

SECTION 01 10 00-2

- M. Section 01 70 00 - Execution and Closeout Requirements.
- N. Section 01 74 19 - Construction Waste Management and Disposal.
- O. Section 01 78 00 - Closeout Submittals.
- P. Section 01 79 00 - Demonstration and Training.
- Q. All other Division 1 Sections.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

- A. Section 00 43 22 - Unit Prices Form: Monetary values of unit prices.
- B. Section 00 50 00 - Contracting Forms and Supplements: Forms to be used.
- C. Section 00 52 00 - Agreement Form: Contract Sum, retainages.
- D. Section 01 22 00 - Unit Prices: Payment and modification procedures relating to unit prices.

1.03 SCHEDULE OF VALUES

- A. Form to be used: Based on AIA G703 with modifications as described in General Conditions.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization and bonds and insurance.
- F. Refer to General Conditions for additional requirements for the Schedule of Values.
- G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Form to be used: AIA Forms G702 and G703.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- H. Submit three copies of each Application for Payment.
- I. Include the following with the application:
 - 1. Construction progress schedule, revised and current as specified in Section 01 30 00 - Construction Progress Schedule.
 - 2. Current construction photographs specified in Section 01 30 00 - Administrative Requirements.
 - 3. Partial release of liens from major Subcontractors and vendors.
 - 4. Certification of status of project record drawings per General Conditions.
 - 5. Affidavits attesting to off-site stored products.
- J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by

number and description.

K. Pencil Requisition:

1. Prior to each monthly application for payment, and in every case by the 25th day of the month, submit a "pencil requisition" in the same computerized format as the formal application for payment with all columns fully calculated and updated to represent the anticipated formal monthly application for payment.
2. Review the pencil requisition with the Architect, the Architect's consultants, and the Owner's Project Manager, and make adjustments as directed prior to submission of the formal monthly requisition.

1.05 MODIFICATION PROCEDURES

- A. Refer to General Conditions for additional requirements related to Change Orders and Construction Change Directives.
- B. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in General Contractor's employ or subcontractors of changes to the Contract Documents.
- C. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to General Contractor.
- D. For other required changes, Architect will issue a document signed by Owner instructing General Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
- E. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications. General Contractor shall prepare and submit a fixed price quotation within 15 working days.
- F. General Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 60 00.
- G. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
- H. Substantiation of Costs: Provide full information required for evaluation.
 1. Provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- I. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- J. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

- K. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- L. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 70 00 - Execution and Closeout Requirements.
 - 2. Other requirements for Substantial Completion and final completion indicated in the General Conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 22 00 UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. List of unit prices, for use in preparing Bids.
- B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.
- D. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
 - 1. C.Y. = Cubic Yards.
- E. Measurement by Area: Measured by square dimension using mean length and width or radius.
 - 1. S.Y. = Square Yards.
 - 2. S.F. = Square Feet.
- F. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
 - 1. L.F. = Linear Feet.
 - 2. V.F. = Vertical Feet.
- G. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.
 - 1. EA = Per Unit.
- H. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.
- I. General Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.
- J. All work is to be accomplished in accordance with applicable sections of the Specifications.

1.03 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
- B. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from the transporting vehicle.
 - 4. Products placed beyond the lines and levels of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected Products.

1.04 SCHEDULE OF UNIT PRICES

- A. The Schedule of Unit Prices is listed at Section 00 43 22 - Unit Prices Form.
- B. Base Bid Amounts to be Carried:

1. The base bid includes all work within the limit of work lines as shown on the drawings and specified herein. Any allowances provided for herein are to accommodate potential unforeseen subsurface conditions and shall be part of the base bid. If such conditions are not found, a credit at the above amounts will be sought by the Owner.
2. The contractor shall carry as part of the base bid a value for the following materials and quantities as defined at Division 31 section(s) pertaining to Earthwork:
 - a. 1,000 cubic yards of Unsuitable materials (Removal and replacement with structural fill).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.

1.02 RELATED REQUIREMENTS

- A. Section 00 21 13 - Instructions to Bidders: Instructions for preparation of pricing for alternatives.
- B. Section 00 41 00 - Form for General Bid: Recording of General Bid cost associated with alternates.
- C. Section 00 41 02 - Form for Filed Sub-Bid: Recording of costs associated with Filed Sub Bid work as part of alternates.

1.03 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option in the order that they are presented below. Accepted alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 – Rough Framing, Electrical, HVAC and above ground rough plumbing in Basement.
 - 1. Description:
 - a. Base Bid: Does not include non load bearing wood stud walls, HVAC units, ductwork, distribution, above ground rough plumbing, wiring for devices.
 - b. Alternate: Construct new as shown on Drawings, including:
 - 1) Walls.
 - 2) Rough Electrical wiring.
 - 3) Rough above slab plumbing for sinks, toilets and vanities
 - 4) HVAC units for basement, ductwork, distribution.
- B. Alternate No. 2 – Install GWB and ceiling in the Basement:
 - 1. Description:
 - a. Base Bid: Does not include GWB, insulation, ceilings, and related specification sections in the basement.
 - b. Alternate: Provide GWB, Insulation, Acoustical Ceilings, HVAC diffusers, finish electrical devices as shown on the drawings for Alternate number 2.
- C. Alternate No. 3 – Install doors, flooring and tile in the Basement
 - 1. Description:
 - a. Base Bid: Does not include Doors, Hardware, Flooring and tile in the Basement unless otherwise shown
 - b. Alternate: Furnish and install doors, frames, hardware, flooring, tile, vanities, finished plumbing, bathroom accessories in the Basement as shown on the drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Progress photographs.
- F. Coordination drawings.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals.
- I. Submittal procedures.
- J. Requests for Information (RFI).

1.02 RELATED REQUIREMENTS

- A. Section 01 31 14 - Coordination.
- B. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.
- C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- D. Section 01 78 00 - Closeout Submittals: Project record documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document any participant wishes to make part of the project record.
 - 2. General Contractor and Architect are required to use this service.
 - 3. It is General Contractor's responsibility to submit documents in PDF format.
 - 4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
 - 5. The submittal service website shall permit the assignment of administrative limitations to user firms, such that ability to view, or upload/download information to specific folders can be established by firm or staff personnel.
 - a. The Architect shall be provided the sole ability to manage the administrative limitations.
 - 6. The Architect shall be provided the ability to manage or edit the names and locations of the files uploaded by the contractor, and the format of logs created automatically by the submittal service.
 - 7. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.

8. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to physical samples or color selection charts. Transmittals and other documentation of such samples shall be made electronically via the submittal service, and will be reviewed and returned electronically by the Architect.
 - a. The review of sample submittals will not begin until the electronic submittal of the transmittal and submittal forms are entered into the web-based submittal service, and samples are delivered to the Architect's office, whichever is later.
9. The review time for submittals posted to the web-based submittal service after close of business or on Saturdays, Sundays, or holidays shall begin on the next business day.
- B. Cost: The cost of the service is to be paid by the General Contractor; include the cost of the service in the contract amount.
- C. Submittal Service: Use one of the following:
 1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com.
 2. Newforma Project Cloud: www.newformaprojectcloud.com.
 3. AEC Sync / Attolist, Inc.: www.aec-sync.com.
- D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and General Contractor participating; further training is the responsibility of the user of the service.
- E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 GENERAL PRECONSTRUCTION MEETING

- A. General Contractor will schedule a meeting to take place within 15 days after Notice to Proceed.
- B. Attendance Required:
 1. Owner.
 2. Owner's Project Manager.
 3. Architect.
 4. Architect's consultants as invited by Architect.
 5. General Contractor's Project Manager and Superintendent.
 6. Major Subcontractors and Suppliers.
 7. Others as appropriate..
- C. Suggested Agenda:
 1. Introductions.
 2. Architect's overview of project and key aspects of the construction.
 3. Owner's statements.
 4. Distribution and discussion of:
 - a. List of major subcontractors and suppliers.
 - b. Projected Construction Schedules.
 - c. Submittals Schedule Checklist.
 5. Critical work sequencing.
 6. Major equipment deliveries and priorities.
 7. Project coordination:
 - a. Designation of responsible personnel.
 8. Distribution of Contract Documents.
 9. Designation of personnel representing the parties to Contract, Owner and Architect.

10. Procedures and processing of:
 - a. Applications for Payment.
 - b. RFIs.
 - c. Proposal requests.
 - d. Submittals.
 - e. Change Order proposals.
 - f. Change Orders.
 - g. Construction Change Directives.
 11. Procedures for maintaining Record Documents.
 12. Use of premises:
 - a. Office, work and storage areas.
 - b. Owner's requirements.
 13. Construction facilities, controls and construction aids.
 - a. Temporary facilities related to project phases.
 14. Temporary utilities:
 - a. Temporary utilities related to project phases.
 15. Safety and first aid procedures.
 16. Security procedures.
 17. Survey and Layout.
 18. Housekeeping procedures.
 19. Scheduling activities of a Geotechnical Engineer.
 20. Scheduling inspections to be provided by other consultants to the Owner.
 21. Scheduling mock-ups.
 22. Scheduling trade specific pre-construction conferences.
- D. Record minutes and distribute copies within three days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PREINSTALLATION MEETINGS REQUIRED BY INDIVIDUAL SECTIONS

- A. General Contractor will schedule meetings required by individual specification sections.
- B. Attendance Required:
 1. Owner's Project Manager.
 2. General Contractor's Project Manager and Superintendent.
 3. Subcontractor and manufacturer's technical representative for the Section for which the meeting is required.
 4. Subcontractors whose work is affected by or must be coordinated with the Section for which the meeting is required.
 5. Others as appropriate.
- C. Suggested Agenda:
 1. Introductions.
 2. Critical work sequencing and scheduling.
 3. Major equipment deliveries and priorities.
 4. Project coordination:
 - a. Designation of responsible personnel.

- b. Coordination requirements of an impacts of the work on related subcontractor work and sequence of installation.
- D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner's Project Manager, Architect, as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Owner concerns related to ongoing occupancy and school operations.
 - 3. Review of Work progress.
 - 4. Field observations, problems, and decisions.
 - 5. Identification of problems that impede, or will impede, planned progress.
 - 6. Review of submittals schedule and status of submittals.
 - 7. Review of off-site fabrication and delivery schedules.
 - 8. Maintenance of progress schedule.
 - 9. Corrective measures to regain projected schedules.
 - 10. Planned progress during succeeding work period.
 - 11. Coordination of projected progress.
 - 12. Maintenance of quality and work standards.
 - 13. Effect of proposed changes on progress schedule and coordination.
 - 14. Other business relating to Work.
- E. Record minutes and distribute copies within three days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.05 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Preconstruction photographs of site, including interfaces with surrounding properties, adjacent paved surfaces including roadways, etc.
 - 2. Accepted mock-up assembly.
 - 3. Completion of site clearing.
 - 4. Excavations in progress.
 - 5. Foundations in progress and upon completion.
 - 6. Structural framing in progress and upon completion.
- E. Views:
 - 1. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.

2. Consult with Architect for instructions on additional views required.
 3. Provide factual presentation.
 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
 5. Point of View Sketch: Provide sketch in electronic PDF form identifying point of view of each photograph. Include Point of View identification in each photo file name.
- F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Via electronic submittal service website.
 2. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
 3. Hard Copy: Provide one printed hardcopy (color) of each image and point of view sketch with each monthly payment requisition.

3.06 COORDINATION DRAWINGS

- A Refer to Section 01 31 14 for requirements.

3.07 SUBMITTALS FOR REVIEW

- A When the following are specified in individual sections, submit them for review:
1. Product data: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
 2. Shop drawings: Prepared specifically for this Project, including details reflecting adjacent materials and conditions applicable to the project. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
 3. Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - a. Samples for selection: For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns as physical samples - printed or facsimile representation of colors will not be accepted for review.
 - b. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record document purposes described in Section 01 78 00 - Closeout Submittals.

3.08 SUBMITTALS FOR INFORMATION

- A When the following are specified in individual sections, submit them for information:
1. Design data where engineering is indicated to be performed by the contractor, subcontractor, or product manufacturer.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Construction Waste Management update reports.

8. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.09 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:

1. Project record documents.
2. Operation and maintenance data, including Testing and Balancing Reports.
3. Documentation of training sessions, including DVDs.
4. Warranties.
5. Bonds.
6. Contractor's Release of Liens.
7. Contractor's Insurance Certificates for the General Warranty period.
8. Contractor's Asbestos-Free Certification.
9. Receipt of delivery and acceptance of attic stock or surplus materials by Owner.
10. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.10 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review or Information: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDF files at native size and right-side up; illegible files will be rejected.
- B. Documents for Project Closeout: Refer to Section 01 78 00 - Closeout Submittals for submittal procedures and quantities.
- C. Samples: Submit the number specified in individual specification sections; two of which will be retained by Architect and Owner. Mail physical samples; enclose transmittal and copy of Submittal Data Sheet with physical samples. Post copy of submittal notification to the electronic website.
 1. After review, produce duplicates.
 2. Retained samples will not be returned to General Contractor unless specifically so stated.

3.11 SUBMITTAL PROCEDURES

A. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

B. Electronic submittals are required in pdf format. Reviewed submittals will also be returned electronically.

C. Immediately upon award of a Contract or subcontract, the Filed Sub-Bid or subcontractor shall forward color charts, samples and other product data that cannot be transmitted electronically to be received in the General Contractor's office no later than ONE MONTH AFTER AWARD.

D. The Filed Sub-Bid or subcontractor shall have all shop drawings completed no later than ONE MONTH AFTER AWARD.

E. Identify submittals with the section number and by sequentially numbering each transmittal in the order submitted. As an example, submittal 08 44 13-001 would indicate the first submittal filed under the Glazed Aluminum Curtainwalls section.

1. Revisions to submittals shall be submitted under the original submittal number, which shall be appended with the suffix "R1" for the first resubmittal, "R2" for the second resubmittal, and so on. For example 08 44 13-001-R2 would indicate the second resubmittal of the Aluminum Curtainwalls submittal noted above.
2. DO NOT resubmit submittals previously returned for resubmittal with different sequential numbers without

indicating which submittal the new item supersedes.

3. DO NOT group products specified in different specification sections under one submittal and data sheet.
 4. Submittals prepared and transmitted with Data Sheets that indicate incorrect Specification references, or which contain items from multiple specification sections will be returned without review.
 5. Grouping of multiple items within one specification section into one submittal is not recommended, as the Designer's Action Stamp will govern ALL content within the submittal.
- F. Identify Project, General Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- G. The General Contractor shall sign or stamp each Submittal Data Sheet, certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents, as required by Section 00 72 00 - General Conditions of the Contract.
1. Any submittals forwarded without a completed and signed Submittal Data Sheet will be returned to the contractor without review.
 2. No claims for delay or expense related to the contractor's failure to provide proper submittal data sheets will be considered.
- H. All Filed Sub-Bid-and non-Filed Sub-Bid submittals shall be submitted electronically to the General Contractor.
- I. The General Contractor shall post all submittal documents for review to the electronic document submittal service to be used for project submittal communications.
- J. Deliver samples and other submittals not appropriate for electronic submittal to Architect at their business address. Do not deliver samples to the Resident Engineer's field trailer or at site meetings.
- K. Schedule submittals to expedite the Project, and coordinate submission of related items.
- L. For each submittal for review, allow 15 days excluding delivery time to and from the General Contractor.
1. Review time for submittals posted to the electronic document submittal service begins when submittals are posted and notification to the Architect is provided by the website or contractor. Review time for submittals posted after 2 pm on weekdays, weekend days, or holidays will begin on the next business day.
 2. Review time for samples shipped to the Architect's business address begins upon receipt in the Architect's office; days in transit are not counted in review time.
- M. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- N. Provide space for General Contractor and Architect review stamps.
- O. When revised for resubmission, identify all changes made since previous submission.
- P. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- Q. The Architect will review the first submittal and the first resubmittal for each item submitted without prejudice. Should subsequent resubmittals become necessary due to the contractor's failure to prepare adequate submittals, for reasons such as (but not limited to) failure to acknowledge previous review comments, field conditions, or perform required coordination with other trades, the Architect and designers reserve the right to invoice the Owner for time spent reviewing such resubmittals. The Owner may elect to back-charge the General Contractor for these charges.
- R. Submittals not requested will not be recognized or processed.

3.12 ARCHITECT'S ACTION ON SUBMITTALS

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.
1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp

will be appropriately marked, as follows, to indicate the action taken:

1. Final Unrestricted Release: Where submittals are marked "Reviewed (No Comment)," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
2. Final-But-Restricted Release: When submittals are marked "Reviewed (See Comments)," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
3. Returned for Resubmittal: When submittal is marked "Reviewed (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 in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked "Reviewed (Resubmit)" to be used at the Project site, or elsewhere where Work is in progress.
4. No Review: When submittals are returned marked "Not Reviewed" the content has not been checked for general conformance to the design intent; and the Contractor or subcontractor's continued use of the product or scope submitted is at their own risk. No review does not relieve the contractor or subcontractor from complying with the requirements of the project documents, and the Owner and Architect reserve the right to reject subject work if found to be in deviation from the project requirements or otherwise unacceptable.
5. The Action Stamp applied to each submittal governs ALL content of that submittal, and as such the inclusion of multiple items under one submittal may subject otherwise acceptable content to be returned for resubmittal (when other content is not acceptable.) Submittals will not be "segregated" during review and returned with different actions applicable to portions of the content. The contractor should use good common sense judgement regarding grouping of items when preparing submittals.

3.13 REQUESTS FOR INFORMATION (RFI)

A. Format for RFI Submittals:

1. RFIs are to be submitted exclusively by the Contractor, on the form included in this project manual or reasonable facsimile, indicating at a minimum the following:
 - a. The title "Request For Information".
 - b. Consecutive three-digit RFI Sequence Number.
 - c. Origin of RFI (Contractor, subcontractor, Vendor).
 - d. Critical Dates:
 - 1) Date of Request.
 - 2) Date Response Needed.
 - 3) Date of Response (leave blank).
 - e. Relevant Drawing and/or Spec Section.
 - f. RFIs must include sufficient clear information to determine the specific location(s), trade(s), material(s), or assembly(ies) in question. RFIs that are not clear will be returned unanswered.
 - g. All RFI's submitted MUST include a proposed solution, including a statement of any potential impact on project schedule or cost.
 - 1) RFI's submitted without recommended solutions may incur back-charges to the contractor. The Architect and their consultants reserve the right to charge for time spent reviewing RFI's submitted that do not include a proposed solution, or demonstrate a failure by the contractor to coordinate the Work with other trades, or where the response to the question posed is evident or reasonably interpreted from the drawings and/or specifications. The Owner, at their discretion, may elect to back-charge the Contractor for these costs.

- B. Processing: Allow sufficient time so the information will not delay installation as a result of the time required for processing.

1. Allow fifteen working days, exclusive of transmittal time.
- C. Information found on documents or in specifications:
1. When the solution to an RFI is readily apparent or easily interpreted from the drawings or specifications, or the RFI presented requires a response is based on required coordination between different subcontractors, the Architect reserves the right to track all time spent reviewing RFI's and preparing responses, and the fee for such time spent will be billed to the Owner as additional services at the rate of \$175 per hour, and deducted from the General Contractor's final requisition.

END OF SECTION

**SECTION 01 30 02
SUBMITTAL DATA SHEET**

SPEC DIVISION	NO.	REV.

GENERAL CONTRACTOR _____

DATE SUBMITTED:	
ITEM SUBMITTED:	
SPECIFICATION PARAGRAPH REF.:	
IS THIS ITEM A SUBSTITUTION?:	<i>(If yes, provide a Substitution Request Form per Section 01 60 00)</i>
RETURN REQUESTED BY:	<i>(Allow 15 working days for Architect, 15 working days for Consultant Reviews)</i>

GENERAL CONTRACTOR'S CERTIFICATION:

The General Contractor hereby certifies that he has reviewed the submitted item / system for compliance with the Contract Documents, verified all required field dimensions, and coordinated this item / system with related items and systems and the overall Work prior to forwarding this submittal to the Architect for review.

SIGNED: _____ DATE: _____

SECTION 01 31 14

COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General Coordination Requirements.
- B. Coordination of Submittals.
- C. Coordination of Elements of the Work.
- D. Coordination of Utilities, mechanical and electrical.
- E. Coordination of Cutting and Patching.
- F. Coordination Documents.
- G. Project Administration.
- H. Coordination of Contract Closeout.

1.02 RELATED REQUIREMENTS

- A. Examine all other Sections of the Specifications for requirements which effect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- C. Section 01 10 00 - Summary: Responsibilities of separate contractors.
- D. Section 01 30 00 - Administrative Requirements: Additional requirements for coordination.
- E. Section 01 32 16 - Construction Progress Schedule.
- F. Section 01 70 00 - Execution and Closeout Requirements: Starting of Systems.
- G. Section 01 74 19 - Construction Waste Management and Disposal.
- H. Section 01 78 00 - Closeout Submittals: Project record documents.
- I. Section 01 79 00 - Demonstration and Training.
- J. All other Division 01 Sections.

1.03 SUBMITTALS

- A. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 COORDINATION REQUIRED

- A. The General Contractor shall coordinate scheduling, submittals, and work of the various sections of specifications and subcontractors to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.
- B. Coordinate progress schedules, including dates for submittals and for delivery of products.
- C. Coordinate sequence of work to accommodate Owner occupancy as specified.
- D. Conduct meetings among subcontractors and others concerned, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- E. Conduct pre-installation conferences with personnel and subcontractors to assure coordination of work.
- F. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.

3.02 PROJECT ADMINISTRATION

- A. Prepare memoranda for distribution to each party involved outlining required coordination procedures.

Include required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.
2. Conduct conferences among subcontractors and others concerned with the Work, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
3. Administrative Procedures: Coordinate scheduling and timing of administrative procedures with other activities to avoid conflicts and ensure orderly progress. Such activities include:
 - a. Preparation of schedules.
 - b. Installation and removal of temporary facilities.
 - c. Delivery and processing of submittals.
 - d. Progress meetings.
 - e. Project Closeout activities.

3.03 COORDINATION DOCUMENTS

- A. Prepare coordination drawings to organize installation of products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.
 1. Coordination Drawings include, but are not necessarily limited to:
 - a. Structure.
 - b. Partition/room layout.
 - c. Ceiling layout and heights.
 - d. Light fixtures.
 - e. Access panels.
 - f. Sheet metal, heating coils, boxes, grilles, diffusers, and similar items.
 - g. All heating piping and valves.
 - h. Smoke and fire dampers.
 - i. Soil, waste and vent piping.
 - j. Major water piping.
 - k. Roof drain piping.
 - l. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
 - m. Above ceiling miscellaneous metal.
 - n. Sprinkler piping and heads.
 - o. All equipment, including items in the Contract as well as items furnished and installed by Owner (OFI) or furnished by Owner and installed by Contractor (OFCI).
 - p. Equipment located above finished ceiling requiring access for maintenance and service. In locations where acoustical lay-in ceilings occur, indicate areas in which the required access area may be greater than the suspended grid system.
 - q. Seismic Restraints.
- B. Timing: Prior to fabricating materials or beginning work, supervise and direct the creation of one complete set of coordination drawings showing complete coordination and integration of work, including, but not limited to, structural, architectural, mechanical, plumbing, fire protection, elevators, and electrical disciplines.
- C. Intent: Coordination drawings are for the Contractor's use during construction and are not to be construed as replacing shop drawings or record drawings. Architect's review of submitted coordination drawings shall not relieve the Contractor from his overall responsibility for the coordination of the Work of the Contract.
- D. Design Files: Upon the Contractor's request, electronic files of the background graphics of the building elements

will be made available to the contractor for their use to begin preparation of required base sheets. The information available for the contractor's use will be limited to architectural CAD files of the floor plans, ceiling plans, and structural framing plans of the building. Plumbing, HVAC, fire protection, electrical, and related utility drawings will not be provided in the interest that the Contractor and pertinent subcontractors lay out and completely coordinate all utilities in the ceiling cavity based on the general layouts shown in the Drawings.

- E. Coordination drawings that are submitted for review and are copies of the contract document drawings and do not represent information created by the installing contractors as to utility routing and sizes will be rejected.
- F. Base sheets: The Contractor shall prepare and provide one accurately scaled set of building coordination drawing "base sheets" on reproducible transparencies showing all architectural and structural work. Base sheets shall be at appropriate scale; congested areas and sections through vertical shafts shall be at larger scale.
 - 1. Highlight all fire rated and smoke partitions.
 - 2. Indicate horizontal and vertical dimensions to avoid interference with structural framing, ceilings, partitions and other services.
 - 3. Indicate elevations relative to finish floor for bottom of ductwork and piping and conduit (6 inches and greater in diameter).
 - 4. Indicate the main paths for installation, or removal of, equipment from mechanical and electrical rooms.
- G. Contractor shall circulate coordination drawings to the following subcontractors and any other installers whose work might conflict with other work. Each of these subcontractors shall accurately and neatly show actual size and location of respective equipment and work. Each subcontractor shall note apparent conflicts, suggest alternate solutions and return drawings to Contractor.
 - 1. Elevator subcontractor.
 - 2. Plumbing subcontractor.
 - 3. Fire Protection subcontractor.
 - 4. Heating ventilating and air conditioning subcontractor(s).
 - 5. Electrical discipline subcontractors.
 - 6. Telecommunications subcontractor.
 - 7. Control system subcontractors.
- H. Review and modify and approve coordination drawings in cooperation with individual installers and subcontractors to assure conflicts are resolved before work in field is begun and to ensure location of work exposed to view is as indicated or as approved by Architect.
 - 1. The Contractor shall stamp, sign and submit coordination drawing originals to Architect for review.
 - 2. Do not commence work in areas described in the coordination drawings until receipt of Architect's comments.
- I. Prepare a master schedule identifying responsibilities for activities that directly relate to this work, including submittals and temporary utilities; organize by specification section.
- J. Identify electrical power characteristics and control wiring required for each item of equipment.
- K. Maintain documents for the duration of the work, recording changes due to site instructions, modifications or adjustments.
- L. After Architect review of original and revised documents, reproduce and distribute copies to concerned parties.

3.04 COORDINATION OF SUBMITTALS

- A. The General Contractor shall schedule and coordinate submittals.
- B. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to Architect.
- C. Check field dimensions and clearances and relationship to available space and anchors.
- D. Check compatibility with equipment and work of other sections, electrical characteristics, and operational control requirements.

- E. When changes in the work are made, review their effect on other work.
- F. Verify information and coordinate maintenance of record documents.

3.05 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

- A. Review proposals and requests for substitution prior to submission to Architect.
- B. Verify compliance with Contract Documents and for compatibility with work of other sections.
- C. Submit with recommendation for action.

3.06 COORDINATION OF ELEMENTS OF THE WORK

- A. Before commencing any work, the General Contractor shall prepare and submit a sequence of operations for all work under this Contract for approval by the Architect.
- B. If, in the judgment of the Architect, continued work under the approved sequence of operations may interfere with the progress of the Work, the Architect may direct the General Contractor to accelerate, interrupt, or cease work at particular points. The General Contractor shall make reasonable changes in the sequence of operations to accommodate these directions at no additional cost to the Owner.
- C. The General Contractor shall be responsible for the proper fitting of all work and the coordination of the operations of all trades, subcontractors, materials and equipment engaged upon the work. He shall guarantee each of his subcontractors the dimensions which they may require for the fitting of their work to all surrounding work and shall do or cause the subcontractors to do all cutting, fitting, adjusting and patching necessary to make the several parts of the Work come together properly and to fit the Work to receive or be received by that of other contractors.
- D. The General Contractor shall have a competent superintendent and assistants on the Work at all times during the progress of the Work to assure the proper coordination and expediting of the Work.
- E. The General Contractor shall lay out the Work, and be responsible for all lines, elevations, and measurements of the building, grading, paving and other work executed under the Contract. He shall exercise proper precaution to verify the dimensions shown on the Drawings before laying out the Work and will be held responsible for any error resulting from his failure to exercise such precaution.
- F. The General Contractor shall be in charge of the entire Work and shall be responsible for the prompt coordination of all trades, including his own forces and his subcontractors, as well as the Owner's separate Contractors if they are on the job during the Contractor's operations, and become fully familiar with all work required under the Contract.
- G. Care shall be given to the proper scheduling, delivery, and installation of items to be built into rough construction which will affect the latter portions of the Work, such as anchors, pipe sleeves, inserts, conduit, pipes, lugs, clips, brackets, braces, hangers, bolts, miscellaneous metal, wood blocking and similar items. These items are not necessarily specified under the trade Section under which they are to be installed. The General Contractor shall ascertain that all are properly installed in their correct locations at the proper time so as to prevent cutting and patching of finished work.
- H. The General Contractor shall be fully responsible for coordination of general construction work with that of subcontractors for plumbing, sanitary, electrical, photovoltaic, heating and ventilating, and other specialized trades. He shall investigate, together with the subcontractors involved, the routing of pipes, ductwork, and conduit with particular attention to interference of structural members, other pipes, ducts, and conduit cuts, head room conditions, door and window openings and swings, pipe chases, and similar features of the building which may affect installation and proper functioning of such items.
- I. Changes in design locations, which may be necessary in the routing of pipes and ducts, or in the location of any mechanical, electrical or other equipment, shall be anticipated and made prior to installation. Additional compensation will not be allowed for costs incurred as a result of the General Contractor's failure to anticipate the necessity for such changes.
- J. There shall be no change or variation in ceiling height, wall layout, shaft, chase, furring or other dimensions shown on Drawings, without the specific written approval of the Architect.
- K. The General Contractor's responsibility for the coordination of all work under the Contract shall be complete, and shall extend to all modifications in the work, whether or not such modifications entail a change in the Contract Price. Where the Contract Documents allow an optional material or method of performing a portion of the Work,

or where the General Contractor is ultimately allowed or directed to perform a part of the Work using a substitute material or method, the General Contractor shall provide all other coordination and additional work that such change necessitates, without any additional cost to the Owner.

3.07 UTILITIES, MECHANICAL AND ELECTRICAL COORDINATION

- A. Coordinate the Work of Site Work, Equipment, Mechanical, and Electrical Divisions with Work of other Divisions.
- B. Give all advance notice to public utility companies as required by law, and provide proper disposition, subject to Architect's approval of all existing pipe lines, conduits, sewers, drains, poles, wiring, and other utilities that in any way interfere with the Work, whether or not they are specifically shown on the Drawings.
- C. Notify Owner and appropriate authorities when coming across an unknown utility line(s), and await decision as to how to dispose of same.
- D. When an existing utility line must be cut and plugged or capped, moved or relocated or has become damaged, notify the Owner and Utility company involved, and assure the protection, support or moving of utilities to adjust them to the new work.
- E. The Contractor shall be responsible for all damage caused to existing, active utilities located within the limits of this Contract, whether or not such utilities are shown on the Drawings, including resultant damages or injuries to persons or properties.
- F. Provide openings in the work for penetration of mechanical and electrical work.

3.08 COORDINATION OF CUTTING AND PATCHING

- A. Cutting and patching coordination: The General Contractor is responsible for coordination of all cutting and patching necessary for the completion of this Contract and for the quality and appearance of all patch work in expose-to-view finished materials.

3.09 OBSERVATION OF WORK

- A. Observe work for compliance with Contract Documents.
- B. Maintain a list of observed deficiencies and defects; promptly submit.

3.10 DOCUMENTATION

- A. Observe and maintain a record of tests. Record:
 - 1. Specification section number and product name.
 - 2. Name of General Contractor, subcontractor, and supplier.
 - 3. Name of testing agency and name of inspector.
 - 4. Name of manufacturer's representative present.
 - 5. Date, time, and duration of tests.
 - 6. Type of test, and results.
 - 7. Retesting required.
- B. Assemble background documentation for dispute and claim settlement.
- C. Submit copies of documentation to Architect upon request.

3.11 COORDINATION OF CONTRACT CLOSEOUT

- A. The General Contractor shall coordinate the completion and cleaning of the work of separate subcontractors in preparation for the Substantial Completion of portions of the Work designated for partial Owner occupancy.
- B. After the Owner occupancy of premises, coordinate access to the site by various subcontractors for correction of defective or unfinished work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- C. Assemble and coordinate closeout submittals specified in Section 01 78 00.

3.12 EQUIPMENT START-UP

- A. Verify utilities, connections, and controls are complete and equipment is in operable condition as required by Section 01 70 00.

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- B. Observe start-up and adjustments, test run, record time and date of start-up, and results.
- C. Observe equipment demonstrations made to Owner; record times and additional information required for operation and maintenance manuals.

3.13 INSPECTION AND ACCEPTANCE OF EQUIPMENT

- A. Prior to inspection, verify that equipment is tested, operational, clean, and ready for operation.
- B. Assist Owner's Project Manager and Architect with review. Prepare list of items to be completed and corrected.

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, with network analysis diagrams and reports.
- C. Submittals Schedule.

1.02 RELATED SECTIONS

- A. General Conditions of the Contract.
- B. Section 01 10 00 - Summary: Work sequence.
- C. Section 01 30 00 - Administrative Requirements.

1.03 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
 - 1. Preliminary Schedule shall be in bar chart form.
- B. Schedule Planning Session: Within 15 days of Contract Award, the General Contractor shall meet with Owner and its Consultants to review the planned approach to scheduling the Work.
- C. Baseline Schedule: Within sixty (60) days from the award of the Contract, prepare and submit a draft Construction Schedule to Owner and Architect for their review and comment.
 - 1. The General Contractor shall modify the draft schedule as necessary and within ten (10) days submit the revised schedule to Owner and Architect.
- D. Within 30 days of Notice to Proceed, provide a Submittals Schedule for Shop Drawings, Product Data and Samples. This shall coincide and align with Project Schedule and critical path items and dates as noted.

1.04 QUALITY ASSURANCE

- A. Scheduler: General Contractor personnel or specialist Consultant specializing in CPM scheduling with five years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.
 - 1. The General Contractor shall submit resume of proposed scheduler to the Owner for approval. This person shall not be the same person as the Project Superintendent or Project Manager.
- B. General Contractor's Administrative Personnel: five years minimum experience in using and monitoring CPM schedules on comparable projects.

1.05 SCHEDULE FORMAT

- A. All Schedules required by the Project Schedule Program shall be a computer generated, critical path method (CPM) network utilizing the precedence diagram and Gantt Chart method of scheduling.
 - 1. Use commercially available CPM scheduling software to develop and maintain the schedule, and to prepare and print spreadsheets, schedules, Gantt Charts, and reports. Prepare a spreadsheet listing activities, a network schedule showing the connections between activities, and Gantt Charts (bar charts) required by this Section.
 - a. Acceptable software includes the most recent editions of the following:
 - 1) Oracle: Primavera.
 - 2) Microsoft Project.
 - 3) Prolog Manager.
 - 4) Phoenix CPM.

- 5) Other software acceptable to the OPM and Owner.
- B. Provide supplementary drawings in the form of site plans and floor and roof plans marked up to show the following for each required phase and sub-phase of construction:
1. Construction limits by phase.
 2. Staging areas.
 3. Construction material delivery routes.
 4. Owner delivery routes.
 5. Owner parking.
 6. General Contractor personnel parking.
 7. Barricades including traffic control devices and construction fencing.
 8. Temporary facilities including General Contractor's office, Clerk's and/or Project Manager's office, Contractor and Sub-Contractor storage trailers.
 9. Temporary protected walkways for Owner access around or through construction zones to facilities and areas required to be maintained during construction.
 10. Other required temporary construction.
 11. Signs including project signs and traffic control signs.
 12. Required exits from existing facilities.

1.06 CONTENT

- A. The Project requires an integrated cost/schedule controls program that the General Contractor shall comply with until final completion of all Work. The General Contractor is advised that its schedules as specified herein will be an integral part of the Owner's management program. The General Contractor's schedules will be used by the Owner to monitor project progress and as a critical decision making tool. Accordingly, the General Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both timely and accurate throughout the life of the project. The planning, scheduling, and execution of the Work and the accuracy of any Project Schedule shall remain the sole responsibility of the General Contractor.
1. The Project Schedules shall be used by the Owner/Architect and General Contractor for the following purposes as well as any other purpose where the issue of time is relevant:
 - a. To communicate to the Owner/Architect the General Contractor's current plan for carrying out the Work;
 - b. To identify work paths that are critical to the timely completion of the Work;
 - c. To identify upcoming activities on the critical path(s);
 - d. To evaluate the best course of action for mitigating the impact of unforeseen events;
 - e. As the basis of progress payments to the General Contractor;
 - f. As the basis for analyzing the time impact of changes in the Work;
 - g. As a reference in determining the cost associated with increases or decreases in the Work;
 - h. To identify when submittals will be submitted to the Architect;
 - i. To prioritize the Architect's review of submittals;
 - j. To document the actual progress of the Work;
 - k. To evaluate resource requirements of the General Contractor and the Owner/Architect;
 - l. To integrate the Work with the operational requirements of the Owner's facilities;
 - m. To facilitate efforts to complete the Work in a timely manner.
- B. The Project Schedule Program requires the following schedules and elements:
1. Draft Schedule Submittal: Within 15 days following receipt of the Notice to Proceed, submit the following to the Architect and OPM for review:

- a. A feasible CPM schedule for completion of the entire Work under this contract within the times specified.
 - b. Demonstrate the format to be used for the detailed CPM schedule complying with the requirements of this section.
 - c. At a minimum, include the following milestone dates:
 - 1) Notice to Proceed.
 - 2) Start of foundation work.
 - 3) Start of Steel erection.
 - 4) Steel "topping off".
 - 5) Completion of Slab on Grade and foundation work.
 - 6) Completion of elevated slab work.
 - 7) Start of roofing work.
 - 8) Start of masonry work.
 - 9) Building weather-tightness achieved.
 - 10) Start and completion of each phase of the work as defined in the construction documents.
 - 11) Substantial Completion.
2. Schedule Planning Session: Within 5 working days after submittal of the Draft Schedule, and prior to submission of the Baseline Schedule, the General Contractor shall host and conduct a 1-day schedule planning session. This session will be attended by the Owner, Architect, Owner's Project Manager, General Contractor's Project Manager, Superintendent, and Scheduler, and responsible representatives of major subcontractors. During this session, the General Contractor shall present in detail its planned approach to the project (including the Work to be performed by the General Contractor and its subcontractors) including, but not limited to: the planned construction sequence and phasing; planned crew sizes; summary of equipment types, sizes, and numbers to be used for each work activity; estimated durations of major work activities; the anticipated critical path of the project and a summary of the activities on that critical path; a summary of the most difficult schedule challenges the General Contractor is anticipating and how it plans to manage and control those challenges.
 3. Baseline Schedule: The Baseline Schedule Submittal shall incorporate the entire scope of the Work. The Baseline Schedule shall be the Schedule of Record from which entitlement for adjustments in Contract Time shall be measured.
 4. Baseline Schedule Revision: A Baseline Schedule Revision occurs whenever changes in the original Baseline Schedule are required to accurately reflect any changes in the General Contractor's logic, durations or plan for performing the Work or the impact of any approved changes in the Work. Any proposed changes and/or revisions to the Baseline Schedule shall be incorporated into the Current Baseline Schedule and submitted as a Baseline Schedule Revision Submittal. This Baseline Schedule Revision Submittal must accurately reflect the General Contractor's plan (including accurate logic and durations) for completing the remaining Work. Once it is determined by the Owner/Architect that the submitted Baseline Schedule Revision accurately reflects the General Contractor's plan for completing the remaining Work, the Baseline Schedule Revision shall become the Schedule of Record from which entitlement for adjustments in Contract Time shall be measured, and shall be used for subsequent Schedule Updates.
 5. Monthly Schedule Updates: Monthly Progress Schedule Updates shall update the Baseline Schedule with actual status during the period of the Update and reflect the General Contractor's current plan for performing the Work. An updated schedule shall be submitted with each application for payment.
 6. Recovery Schedule: A proposed schedule that shows how the General Contractor plans to revise the Current Baseline Schedule to remove or mitigate delays.
 7. Schedule Narrative: Provide a narrative report as needed to define:
 - a. Problem areas, anticipated delays, and the impact on the schedule.

- b. Corrective action recommended, and its affect.
 - c. Changes since last Schedule Update.
 - d. The effect on changes on schedules of other contractors.
- 8. The above listed Project Schedules shall be used for evaluating all issues related to time for this Contract. The Project Schedules shall be updated in accordance with the requirements of this Section to reflect the actual progress of the Work and the General Contractors current plan for the timely completion of the Work.
- C. The Project Schedules shall at all times accurately reflect the General Contractor's current plan for the Work. This Section requires the General Contractor to submit the Project Schedules in a specific format. Failure to meet the full requirements of this Section will adversely affect the Owner/Architect's ability to administer this Contract.

1.07 SUBMITTAL SCHEDULE

- A. Required Submittals and Delivery Activities:
 - 1. Submittal List: Submittals Schedule for Shop Drawings, Product Data and Samples: Prepare the schedule in chronological order; include all submittals required during construction. The General Contractor shall submit a list in tabular format of all submittals required by the Contract Documents in both electronic and hard copy format. The tabular submittal list shall contain the following information for each submittal:
 - a. Scheduled date for first submission.
 - b. Specification Section.
 - c. Submittal Category.
 - d. Name of Subcontractor.
 - e. Description of the submittal and part of the Work covered.
 - f. Scheduled date for resubmittal (when applicable).
 - g. Scheduled date for the Architect's final release or approval.
 - 2. Submit revised schedules with each application for payment and/or as otherwise required by this Section.

1.08 PROGRESS REVISIONS

- A. Indicate progress of each activity to date of submission.
- B. Show changes occurring since previous submission of schedule:
 - 1. Major changes in scope.
 - 2. Activities modified since previous submission of schedule.
 - 3. Revised projections of progress and completion.
 - 4. Other identifiable changes.

1.09 DISTRIBUTION

- A. Distribute copies of the schedules to:
 - 1. Architect.
 - 2. Owner's Representative (Project Manager).
 - 3. Owner.
 - 4. Subcontractors.
 - 5. Other parties required to comply with scheduled dates.
 - 6. Post copies in the Project meeting room and temporary field office. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- B. Instruct recipients to report promptly to the General Contractor, in writing, any problems anticipated by the projections shown in the schedules.
- C. Electronic copies shall be provided if requested by Owner/Architect.

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Mock-ups.
- C. Control of installation.
- D. Tolerances.
- E. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

- A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- C. Section 01 45 23 - Structural Testing and Inspecting Services.
- D. Section 01 57 21 - Indoor Air Quality Controls.
- E. Section 01 60 00 - Product Requirements: Requirements for material and product quality.
- F. Section 01 70 00 - Execution and Closeout Requirements.
- G. Section 01 74 19 - Construction Waste Management and Disposal.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.
- B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Mock-ups: Upon acceptance of Mock-up assembly, submit photographs of sufficient clarity to document the level of quality and installation techniques used in the construction.
- C. Testing Agency Qualifications:
 - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
- D. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- E. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to General Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.

- c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Conformance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
- F. Certificates: When specified in individual specification sections, submit certification by the manufacturer and General Contractor to Architect, in quantities specified for Product Data.
- 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- G. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- H. Manufacturer's Field Reports: Submit three copies of field reports for informational purposes.
- 1. Submit report in duplicate within 5 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.05 REFERENCES AND STANDARDS

- A. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- B. Obtain copies of standards where required by product specification sections.
- C. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

1.06 TESTING AND INSPECTION AGENCIES

- A. Owner will employ services of an independent testing agency to perform certain specified testing and will pay the cost of such testing, except that the General Contractor shall pay the cost of retesting of failed tests. Tests performed by the Owner's independent testing agency shall include the following:
 - 1. In-place earthwork density testing as described in Section 31 20 05.
 - 2. Testing to be directed by the Structural Engineer of Record in accordance with Section 01 45 23, including but not limited to testing so listed in the following Sections:
 - a. Section 03 30 00 - Cast in Place Concrete.
 - b. Section 04 20 00 - Unit Masonry: Mortar tests.
 - c. Section 05 12 00 - Structural Steel Framing.
 - 3. Other testing which the Owner may elect to do, but such testing shall not relieve the General Contractor and Subcontractors of responsibility for specified tests.
- B. The General Contractor shall employ and pay for services of an independent testing agency to perform all other specified testing and inspection, including but not limited to:

1. All other testing and inspection required by these project specifications.
2. All other testing and inspection required by applicable regulations.
- C. Employment of agency in no way relieves General Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- D. General Contractor Employed Agency:
 1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 548, ASTM E 543, ASTM C 1021, ASTM C 1077, ASTM C 1093, and ASTM C 1021.
 2. Inspection agency: Comply with requirements of ASTM D290, ASTM D3740, ASTM E329, and ASTM E548.
 3. Laboratory: Authorized to operate in the State of Massachusetts.
 4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Construct mock up assembly at project site for Architect's review and acceptance in accordance with all requirements of Contract Documents. Refer to individual specification sections for general product and installation requirements.
- B. Mock-up shall be erected as indicated in the drawings.
- C. Schedule submittals such that materials included in mock-up are submitted and reviewed prior to construction of mock-up. Construct mock-up using products and materials as accepted during the submittal process. Use full size samples representative of actual sizes, finishes, and colors as accepted.
- D. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- E. Obtain Architect's acceptance of the level of quality and material installation methods prior to commencing with the work that the mock-up represents.
- F. Execute modifications to the mock-up if required by the Architect to gain acceptance.
- G. Accepted mock-ups shall be a comparison standard for the remaining Work.
- H. Protect and maintain mock-up until directed to remove it.
- I. Where mock-up has been accepted by Architect, remove mock-up and clear area at completion of the project or when directed to do so. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

3.03 TOLERANCES

SECTION 01 40 00-3

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and General Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and General Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of General Contractor.
 - 4. Agency has no authority to stop the Work.
- D. General Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by General Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by General Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-conformance to specified requirements shall be paid for by General Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate

instructions when necessary.

- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
 - 1. Observer subject to approval of Architect.
 - 2. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Regulatory requirements applicable to this project are the following:
1. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
 2. Massachusetts Architectural Access Board Accessibility Regulations (521 CMR).
 3. 29 CFR 1910 - Occupational Safety and Health Standards; as a work place.
 4. Building Code: Massachusetts State Building Code, 9th Edition.
 - a. MA amendments to ICC (IBC) - ICC International Building Code, 2015.
 - b. MA amendments to ICC (IEBC) - ICC International Existing Building Code, 2015.
 5. Fire Safety Code: Massachusetts State Fire Code (527 CMR).
 6. Plumbing Code: Massachusetts Uniform State Plumbing Code (248 CMR).
 7. Mechanical Code: ICC (IMC) - ICC International Mechanical Code, 2015, with MA State amendments.
 8. Electrical Code: Massachusetts State Electric Code (527 CMR 12).
 - a. NFPA 70 - National Electrical Code, including MA State amendments.
 9. Building Energy Code: ICC (IECC) - ICC International Energy Conservation Code, 2015, with MA State amendments.
 - a. MA Stretch Energy Code (Appendix 115 AA to the State Building Code) has been adopted by the Town of Westwood.
 - b. ASHRAE 90.1 (2018).

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements.

1.03 QUALITY ASSURANCE

- A. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract provide the direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Massachusetts.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

STRUCTURAL TESTING AND INSPECTING SERVICES

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. The 9th Edition of the Massachusetts State Building Code, 780 CMR, under which this project is designed and will be built, requires the structural engineer of record (SER) to provide a program of structural tests and inspections for this project in accordance with 780 CMR 17.00. The SER is the structural engineer (an individual) who is in responsible charge of the preparation of the structural drawings and structural specifications for this project and whose Massachusetts professional engineering seal appears on said structural drawings.
- B. The SER has prepared a document entitled *Program of Structural Tests and Inspections*, which has been or will be submitted to the building official who has jurisdiction over this project, with the application for a building permit.
- C. The program of structural tests and inspections shall not relieve the general contractor or its subcontractors of their responsibilities and obligations for quality control of the Work, their other obligations for supervising the work, for any design work which is included in their scope of services, and for full compliance with the requirements of the Contract Documents. Furthermore, the detection of, or failure to detect, deficiencies or defects in the Work during the testing and inspection conducted pursuant to the program shall not relieve the general contractor or its subcontractors of their responsibility to correct all deficiencies or defects, whether detected or undetected, in all parts of the Work, and to otherwise comply with all requirements of the Contract Documents.
- D. The program of structural tests and inspection does not apply to the general contractor's equipment, temporary structures used by the general contractor to construct the project, the general contractor's means, methods, and procedures, and job site safety.

1.02. GENERAL CONTRACTOR'S RESPONSIBILITIES

- A. Where the document *Program of Structural Tests and Inspections* indicates that a structural component or system is subject to structural tests and inspections by 780 CMR 17.00 and that the SER for the project has not been retained to design said component or system or to prepare a performance specification for said component or system, and the Architect has not otherwise provided for the structural design of said component or system, the general contractor shall retain, or require others under his aegis to retain, a professional engineer registered in Massachusetts to design said component or system and to provide the required program of structural tests and inspections for said component or system.
- B. This engineer shall visit the site and provide an affidavit to the SER addressed to the Building Inspector verifying that construction has been completed in accordance with the submitted documents.
- C. The general contractor shall provide free and safe access to the Work for the SER and all other individuals who are observing the Work or performing structural tests or inspections. The general contractor shall provide all ladders, scaffolding, staging, and up-to-date safety equipment, all in good and safe working order, and qualified personnel to handle and erect them, as may be required for safe access.
- D. The general contractor shall give reasonable notice to the SER, or to those performing inspections and tests under the SER's direction, of when the various parts of the Work will be ready for inspection. The general contractor shall obtain instructions from the SER as to what is reasonable notice for the various aspects of the work, and who is to be notified.
- E. The Owner reserves the right to back charge the general contractor for additional expense incurred by the Owner for the services of the SER or those under his direction when work is not reasonably ready for inspection in accordance with the notice provided by the general contractor.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary telecommunications services.
- B. Temporary sanitary facilities.
- C. Temporary Barriers, enclosures, and Barricades and Fencing.
- D. Temporary Bracing, Shoring, Sheeting, Tie-Down.
- E. Temporary Hoisting Equipment and Machinery.
- F. Staging and Scaffolding.
- G. Temporary Stairs, Ladders, Ramps, Platforms, Etc..
- H. Temporary Protective Treads and Handrails at Permanent Stairs.
- I. Temporary Protective Covers.
- J. Exterior Enclosures.
- K. Security.
- L. Vehicular access and parking.
- M. Waste removal / dumpster.
- N. Water Control.
- O. Dust Control.
- P. Project identification sign.
- Q. Removal of Temporary Facilities and Controls.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements
- B. Section 01 51 00 - Temporary Utilities.
- C. Section 01 52 13 - FIELD OFFICES AND SHEDS.

1.03 TEMPORARY TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field offices at time of project mobilization.
- B. Provide telecommunication services and equipment needed for General Contractor's field office at no additional cost to Owner.

1.04 TEMPORARY SANITARY FACILITIES

- A. The General Contractor shall make all arrangements for and provide sanitary facilities for the use of all workers. Facilities shall meet all requirements of the local authorities having jurisdiction. Refer to General Conditions for additional requirements.
- B. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
 - 1. Facilities shall be adequately screened to be inaccessible to flies.
- C. Maintain daily in clean and sanitary condition.
- D. Completely remove the facilities upon completion of the contract.

1.05 TEMPORARY BARRICADES AND FENCING

- A. 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. The General Contractor shall provide fencing of the construction and staging areas. Fencing and lockable gates shall be as detailed on the drawings; it shall be not less than six feet in height above grade and shall be continuous, surrounding and enclosing the work area totally separating the general public from construction activity, and of sufficient height to satisfy General Conditions of the Contract. Temporary fencing shall also be provided at other locations indicated on the site drawings. Relocate temporary fencing in accordance with phasing requirements, and remove from site at the conclusion of the project.
- C. The General Contractor shall provide temporary fencing, barricading, and overhead protection of substantial nature to protect workers, 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, and stored or stockpiled materials. Comply fully with governing laws and codes.
- D. Provide protection for plants designated to remain. Replace damaged plants.
- E. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 TEMPORARY BRACING, SHORING, SHEETING, TIE-DOWN

- 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.

1.07 TEMPORARY HOISTING EQUIPMENT AND MACHINERY

- A. Each Filed Sub-Bid Subcontractor entering upon the work shall furnish, install, operate, and maintain in safe condition all hoisting equipment and machinery required for the work of that specific sub-trade.
- B. The General Contractor shall furnish, install, operate, and maintain in safe condition all hoisting equipment and machinery required for his own use.
- C. All hoisting equipment and machinery and operation shall comply in all respects to the governing laws and codes.

1.08 STAGING AND SCAFFOLDING

- A. The General Contractor shall erect such staging and scaffolding in sufficient time and in proper sequence so as not to delay work. Subcontractors shall schedule and commence their work so that building progress is not delayed or obstructed once staging and scaffolding become available.
- B. Staging and scaffolding shall be of engineered design adequate and suitable for the intended purpose and loading and in compliance with all applicable federal, State, and local laws and regulations, shall have all accident prevention devices and other features required by federal, State and local laws and regulations, and shall be erected and removed by experienced stage builders.
- C. Each Filed Sub-Bid Subcontractor entering upon the work shall furnish, erect and maintain all staging and scaffolding required for work under his subcontract. Each Filed Sub-Bid Subcontractor shall dismantle and remove such staging and scaffolding on completion of his work and at other times as necessary to accommodate and facilitate orderly progress of the work including work by other trades.
- D. The General Contractor shall furnish, erect and maintain all staging and scaffolding required for his own work and shall dismantle and remove such staging and scaffolding on completion of his work and at other times as necessary to accommodate and facilitate orderly progress of the work including work by sub-trades.

1.09 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.

1.10 TEMPORARY PROTECTIVE TREADS AND HANDRAILS AT PERMANENT STAIRS

- A. As soon as permanent stairs, ladders, ramps, platforms, etc., are erected, the General Contractor shall provide

temporary protective wood treads and temporary handrails, or other protection acceptable to the Architect, before the stairs are permitted to be used.

1.11 TEMPORARY PROTECTIVE COVERS

- A. After door and fixed glass frames have been installed, the General Contractor shall provide all necessary protective covers and framing required to assure that such items will not be damaged as the work progresses.

1.12 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
- B. The General Contractor shall provide "weather protection," which includes temporary protection of that Work adversely affected by rain, snow, moisture, wind and cold by providing temporary covering or enclosure and/or heating of the work space. Without exception, this shall include tenting of scaffolding related to construction of the building exterior envelope, inclusive of installation of air barrier systems, insulation, and masonry.
- C. Weather protection enclosures and heating shall be provided during the months of November through March to provide adequate working areas in accordance applicable laws. A minimum temperature of 40 degrees Fahrenheit shall be maintained at the working surface in order to permit construction to be carried on during such period in accordance with the Progress Schedule.
- D. After the building or portions thereof are substantially enclosed by permanent or substantial temporary construction having a thermal resistance comparable to the specified permanent construction, the General Contractor shall provide heat therein of not less than 55 degrees F.
- E. Maintain weather protection continuously, 24 hours per day when required to prevent damage to construction.
- F. Temporary weather protection is not required for construction operations that are, in the judgment of the Architect to be impractical to protect, including but not limited to site work, excavation, steel erection, and roofing installation.
- G. The foregoing provisions do not supersede any specific requirements for storage or heating of specific materials, curing of materials and the like listed in individual specification sections."

1.13 SECURITY

- A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.14 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. The General Contractor shall provide and maintain temporary parking as required for the construction personnel, project manager, and visitors (e.g. Owner, Architect, Town Authorities, and inspectors).
 - 1. Construction shall consist of a minimum of 4 inches of trap rock gravel graded to drain.
 - 2. When site space is not adequate, procure and provide additional off-site parking.

1.15 WASTE REMOVAL / DUMPSTER

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide a staging area for separation of staging waste.
- D. The General Contractor shall provide and pay all costs for temporary dumpster type trash containers outside the

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building for use by all Filed Sub-Bids and Non-Filed Sub-Bid 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 continuously ready to receive trash and debris.

1. Excluded from these temporary trash containers shall be (1) all removed existing materials, trash, and debris resulting from demolition operations and (2) all removed materials resulting from site work, including all excavated site materials, whether the work of these categories is by the General Contractor, Filed Sub-Bid Subcontractors, or by other Subcontractors.
- E. 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 be permitted to drop freely therefrom.
- F. All waste materials and rubbish shall be disposed of legally, off the site.
 1. The General Contractor shall maintain record copies of land-fill receipts and shall submit copies of these to the Clerk on a weekly basis.
- G. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the Authorities Having Jurisdiction.
- H. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.16 WATER CONTROL

- A. The General Contractor shall be responsible for site drainage and snow removal within the project limits 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. Legally remove by pumping, draining, or bailing any water which may accumulate or be found on the site within the contract limits where excavating and grading are to be done, whether from rain, surface flow, springs, ground water, backing-up drains or sewers, or from any other cause, at all times, and under any and all circumstances and contingencies that may arise. Form all pump wells, sumps, dams, flumes or other necessary work to keep trenches and excavations entirely clear of water. The General Contractor shall have at all times upon the site, sufficient and satisfactory pumping machinery. Pump wells or well points and under drains as may be required, shall be provided where needed to properly handle the water. The final trimming excavation shall not be done until de-watering means are in place and in operation.
- C. Water from trenches and excavations shall be disposed of in such manner as will not 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 same.
- D. Remove snow and ice from within the contract limits at the site as required to maintain the continual progress of the work, including that required to keep work areas, access roads, storage areas, clear, free and in use, and as required to prevent damage to existing construction and new work in place.

1.17 DUST CONTROL

- A. The General Contractor shall be responsible for minimizing and keeping dust down on the site and adjacent roadways subject to dust from construction activity at all times, 7 days a week. The General Contractor shall have on site and in good working conditions and shall use sufficient, appropriate watering equipment, including watering trucks, hoses, sprinklers, and the like to eliminate dust from construction and related activities, including but not limited to excavation and filling, spreading, rolling, hauling, transporting and delivering, spraying, and all other activities of the Contractor, Subcontractors, and suppliers. In addition, the General Contractor shall:
 1. Maintain, man, and operate a vehicle washing station to remove dust, dirt, mud and debris from truck and equipment wheels and tires before they leave the site.
 2. Remove (on a daily basis) dust, dirt, mud, and debris from adjacent roadways where same is deposited by trucks, equipment, and other vehicles leaving the site.
 3. Provide and maintain temporary (minimum of 4 inch thick) trap rock gravel roadways and parking areas for trucks and personal vehicles to minimize the accumulation of dust, mud, dirt, and debris on wheels and tires.

- B. In the event that dust, mud, dirt, and debris is deposited on or migrates to adjacent property or roadways, the Owner will take the measures necessary to remove such material, and all costs will be deducted from the contract sum.

1.18 PROJECT IDENTIFICATION SIGN

- A. The General Contractor shall furnish and erect a wooden project sign (the lesser of 4' x 8' as shown on the drawings or the maximum size allowed by local sign ordinances) before starting any construction under his Contract, and he shall maintain the sign in acceptable condition during the entire construction period until final acceptance of all work under this Contract. This sign shall be the only advertisement displayed at the Site. The design of the sign will be furnished by the Architect.
 - 1. Location shall be approved by the Architect and Owner.
 - 2. Text shall be painted or vinyl applied by a professional sign painter and shall include the project name, names and addresses of Owner, Architect/Engineer Team and General Contractor as shown in the design.
 - 3. A graphic full-color rendering of the building (approximately 18" x 32") will be provided by the Architect on a disk format and/or hard copy. This image shall be electrostatically reproduced onto high performance vinyl and applied onto the sign at the dimensions shown on the design. The color integrity of the original rendering shall be strictly maintained.
 - 4. The sign shall be two-sided (the same design is displayed on both sides of the sign).
 - 5. The sign shall have two colors (not including the graphic colored rendering); a dark background color, white border/trim and white text. The background color shall be selected by the Architect.
- B. Erect on site at location established by Owner and Architect.
- C. No other signs are allowed without Owner permission except those required by law.

1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

- A. Section 01 50 00 - Temporary Facilities and Controls:
 - 1. Temporary sanitary facilities required by law.

1.03 TEMPORARY ELECTRICITY AND LIGHTING

- A. Cost: By General Contractor.
 - 1. The General Contractor shall pay for the cost of electrical energy consumed by all trades during the construction period.
 - 2. The General Contractor shall pay for all temporary wiring required for his Construction Offices and for Field Offices to be used by the Owner's Representative, Owner's Project Manager, and Architect.
- B. The Electrical Subcontractor shall make arrangements with the local electric utility and shall furnish, install, maintain and remove temporary electrical power and lighting in accordance with Division 26.
 - 1. The Electrical Subcontractor shall pay utility company charges in connection with the temporary service.
 - 2. The Electrical Subcontractor shall make all modifications to temporary power and lighting required to accommodate project phasing.
- C. Wiring to and within shanties and trailers and any resulting increase in service capacity shall be paid for by the subcontractor requiring such supply.
- D. System Description: The Electrical Subcontractor shall provide a system that consists of the following:
 - 1. Complete temporary distribution system including feeders as required and branch circuits suitable supported and protected and located to serve all work areas without hindering permanent construction.
 - 2. Load centers of adequate capacity as required for loads to be served and having branch circuit protection as required. All load centers shall have a NEMA 3R enclosure.
 - a. Provide one load center for every 5,000 square feet of building floor area (each floor).
 - 3. System and equipment ground fault protecting shall be furnished as required by code.
 - 4. The extent of the system shall be sufficient to serve all areas where work is to be performed.
 - a. Temporary lighting shall be based on a minimum of 1 watt per square foot covering each and every square foot of floor area in the building.
 - 1) Install sufficient wiring, lamps, and outlets to insure proper lighting in all rooms, spaces, stairwells, and corridors.
 - 2) Minimum sized lamp used shall be 100 watt. Where higher lighting intensities are required by federal or State Standards or Laws or otherwise specified, increase wattage to provide these increased intensities.
 - b. 120 volt power outlets shall be located to allow reaching any point with a standard 50 foot extension cord.
 - c. Wiring for large power outlets and any resulting increase in service capacity shall be paid for by the subcontractor requiring such supply.
- E. Maintenance:
 - 1. The Electrical Subcontractor shall:

- a. Maintain all wiring and devices in safe operating condition.
 - b. Maintain all lamps in the temporary system and temporary lamps in the permanent system for the duration of the work.
 - c. When changeover of the power system necessitates a shutdown, minimize construction delay by scheduling the outage outside of normal working hours or by providing a standby power source.
- F. Removal:
- 1. The Electrical Subcontractor shall:
 - a. Disconnect and remove temporary electrical system in its entirety at the conclusion of construction.
 - b. Coordinate removal with activities of other contractors and subcontractors.
 - G. Any General Contractor/Subcontractor requiring service for equipment of 230 volts or more than 20 amperes at 115 volts (120 volts) shall have separate feeder installed from service point, and all such installation costs shall be paid by the General Contractor Subcontractor requiring the service.
 - H. No electrical space heating equipment shall be allowed.
 - I. Temporary or permanent service for permanently installed building equipment such as sump pumps, boilers, boiler controls, fans, pumps, etc., shall be the responsibility of the Electrical Subcontractor and shall be installed and maintained so that such equipment may be operated when required and so ordered by the Architect for drainage or temporary heat.
 - J. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
 - K. Provide main service disconnect and over-current protection at convenient location and meter.
 - L. Permanent convenience receptacles may be utilized during construction.
 - M. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft.
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps to fit project conditions.
- C. Maintain lighting and provide routine repairs.

1.05 TEMPORARY HEATING

- A. Cost of Energy: By General Contractor.
- B. The General Contractor shall provide weather protection during the months of November through March in accordance with Massachusetts General Law Chapter 149, Section 44G and 44F(1), additional requirements of the General Conditions, and shall provide heat during construction in accordance with the following requirements.
 - 1. Exception: The Masonry Filed Sub-Bid Contractor shall provide weather protection and heating of masonry stockpiled materials (such as sand, cement, bricks, CMU, precast concrete, and water). The GC shall provide temporary heat to enclosed temporary work areas to appropriate temperature for masonry construction.
- C. Permanent Heating System Not Ready for Operation:
 - 1. Both prior to and after the building is enclosed, heat including but not limited to fuel and/or energy necessary therefore, shall be provided and paid for by the General Contractor as required to accomplish the following:
 - a. Protect completed work.
 - b. Protect material and equipment being installed.
 - 1) Exception: The Masonry Filed Sub-Bid Contractor shall provide weather protection tenting of scaffolding and masonry work and stockpiled materials (such as sand, cement, bricks, CMU, precast concrete, and water).
 - c. Enable workers to accomplish their work in a satisfactory manner.

- d. Maintain the approved progress schedule.
 - 2. The method of heat shall meet all applicable codes and ordinances. Heat shall be maintained at not less than 50 degrees F unless lower temperatures are sufficient to meet the requirements of the paragraph above (C.1. a through d), but in no circumstances less than 40 degrees F.
 - 3. The building shall be considered enclosed when the specified exterior surfaces and required assembly materials are completed so that they exclude the elements and retain the heat. The General Contractor shall make all enclosures of the building as soon as practical in accordance with the approved progress schedule. The approved progress schedule shall include an item entitled "building enclosure". It shall be the responsibility of the General Contractor to notify the Architect and the other contractors/subcontractors that the building is enclosed.
 - D. Permanent Heating System Operable:
 - 1. The General Contractor shall pay all fuel and power costs related to operation of the heating system during construction.
 - 2. Use of the permanent heating system during construction shall not affect any heating system guarantees, and such guarantees shall begin to run only when the Owner accepts the building.
 - E. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
 - F. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- 1.06 TEMPORARY VENTILATION
- A. Existing ventilation equipment may not be used.
- 1.07 TEMPORARY WATER SERVICE
- A. Cost of Water Used: By General Contractor.
 - B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
 - C. Maintain suitable quality water service for construction operations throughout the construction period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 52 13

FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Not Used
- B. Temporary field offices for use of the General Contractor.
- C. Maintenance, relocation if necessary, and removal of field offices and sheds.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
 - 1. Section 00 72 00 - General Conditions Of The Contract
 - 2. Section 01 50 00 - Temporary Facilities and Controls:
 - 3. Section 01 50 00: Parking and access to field offices.

1.03 USE OF EXISTING FACILITIES

- A. Existing facilities shall not be used for field offices.

1.04 USE OF PERMANENT FACILITIES

- A. Consult with OPM and Owner regarding feasibility of use of permanent facilities for field offices.
- B. Coordinate use and occupy same only with advance written approval by Owner (through OPM).
- C. Comply with all Owner requirements for General Contractor use of permanent building spaces, including insurance and other requirements.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.02 CONSTRUCTION

- A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
- B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove at completion of Work.
- C. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy requirements.
- D. Exterior Materials: Weather resistant, finished in one color.
- E. Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or painted; resilient floors and bases.
- F. Lighting for Offices: 50 fc at desk top height, exterior lighting at entrance doors.
- G. Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.03 ENVIRONMENTAL CONTROL

- A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.04 GENERAL CONTRACTOR OFFICE AND FACILITIES

- A. Provide office facilities in size required to accommodate General Contractor's general use and to provide space for project meetings. Provide heat, ventilation, power and light per building code requirements and to satisfaction of AHJ. Provide and maintain throughout duration of project, local telephone service for the legitimate use of those connected with Work. Pay all permits and charges related to temporary telephone service. Maintain a

complete set of current Project drawings and specifications at this office at all times. Maintain a file with all approved Shop Drawings, permits and other data pertinent to the Work.

- B. Telephone: As specified in Section 01 50 00.
- C. Furnishings in Meeting Area: Conference table and chairs to seat at least 12 persons; racks and files for Contract Documents, submittals, and project record documents.
- D. Other Furnishings: General Contractor's option.
- E. Equipment: 10 adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer and other equipment as determined by Contractor.

2.05 GENERAL CONTRACTOR AND SUB CONTRACTOR STORAGE SHEDS

- A. To requirements of various trades.
- B. Dimensions: Adequate for storage and handling of products.
- C. Ventilation: Comply with specified and code.
- D. Heating: Adequate to maintain temperatures specified in respective sections for the products stored.

2.06 OWNER'S PROJECT MANAGER (OPM) AND OWNER

- A. Provide as described in Section 00 52 00 - Contract for Construction Services and General Conditions.

PART 3 EXECUTION

3.01 LOCATION AND ACCESS

- A. Prior to installation of offices and sheds, consult with Architect on location, access and related facilities.

3.02 PREPARATION

- A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.03 INSTALLATION

- A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
- B. Parking: Two hard surfaced parking spaces for use by Owner's Project Manager and Architect, connected to office by hard surfaced walk.
- C. Install office furnishings and equipment ready for use.
- D. Interconnect the Architect's computer and the OPM's computer to the multi-function printer/copier/scanner/Fax and to the laser printer.

3.04 MAINTENANCE AND CLEANING

- A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.
- B. Maintain approach walks free of mud, water, and snow.

3.05 REMOVAL

- A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

SECTION 01 57 21

INDOOR AIR QUALITY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction.

1.02 PROJECT GOALS

- A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cleaning of ductwork is not contemplated under this Contract.
 - 2. General Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
- B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Furnish products meeting the specifications.
 - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Testing and inspection services.
- B. Division 23 Sections:
 - 1. HVAC Air Cleaning Devices: HVAC filters.
 - 2. Testing, Adjusting, and Balancing for HVAC: Testing HVAC systems for proper air flow rates, adjustment of dampers and registers, and settings for equipment.

1.04 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE 52.2.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials by:
 - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 - 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 - 3. Provide sufficient ventilation for drying within reasonable time frame.

- B. Begin construction ventilation when building is substantially enclosed.
- C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.
- D. HVAC equipment and ductwork may NOT be used for ventilation during construction:
 - 1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
 - 2. Exhaust directly to outside.
 - 3. Seal HVAC air inlets and outlets immediately after duct installation.
- E. Do not store construction materials or waste in mechanical or electrical rooms.
- F. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
 - 1. Inspect duct intakes, return air grilles, and terminal units for dust.
 - 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 - 3. Clean tops of doors and frames.
 - 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 - 5. Clean return plenums of air handling units.
 - 6. Remove intake filters last, after cleaning is complete.
- G. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- H. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution procedures.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements.
- B. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- C. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.

1.03 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 LOCAL MATERIALS

- A. To the greatest extent practical, products and materials manufactured, fabricated, or mined in the state of Massachusetts shall be given the highest selection priority. Products and materials manufactured, fabricated, or mined in the United States shall be given second highest selection priority.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Do not use products having any of the following characteristics:
 - 1. Made using or containing CFC's or HCFC's.
- C. Asbestos Prohibition:
 - 1. There shall be no asbestos (i.e., Zero content) in any product or material supplied, delivered to, or built into the project, and it is expressly intended that the materials in these specifications and indicated on the drawings contain no asbestos.
 - 2. As a condition of Substantial Completion, the General Contractor shall submit a signed certificate which states that there is no asbestos in any product or material supplied to or built into the project.

2.03 PRODUCT OPTIONS

- A. In Accordance with Massachusetts General Law, Chapter 30, Section 39M, product selection and use of alternative products shall comply with the following:

1. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
2. Products Specified by Naming One or More Manufacturers: Contractors are encouraged to use a product of one of the manufacturers named and meeting specification requirements. Products of other manufacturers not listed will be considered substitutions, and the submitting contractor shall prepare sufficient data to enable review and comparison of submitted products for conformance to specification requirements, and comparison to listed products in terms of construction, quality, strength, performance, durability, and/or appearance, and submit said comparison using the Product Substitution Form provided following this Section. Allow for thirty (30) days review time for Substitution Requests. The Awarding Authority shall make final determination of acceptance.
3. Products Specified by Naming One Manufacturer as "Proprietary": The specified item has been evaluated and designated by vote of the Awarding Authority as "proprietary"; indicating the strongest preference for the specified product. Products of other manufacturers will be considered substitutions, and the submitting contractor shall prepare sufficient data to enable review and comparison of submitted products for conformance to specification requirements, and comparison to listed products in terms of construction, quality, strength, performance, durability, and/or appearance, and submit said comparison using the Product Substitution Form provided following this Section. Allow for thirty (30) days review time for Substitution Requests. The Awarding Authority shall make final determination of acceptance.
 - a. Refer to Section 01 10 00- Summary for a list of products that have been designated as "proprietary" by the Awarding Authority.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Architect will consider requests for substitutions only within 15 days after date of Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the General Contractor.
- D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- E. A request for substitution constitutes a representation that the submitter:
 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 2. Will provide the same warranty for the substitution as for the specified product.
 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- G. Substitution Submittal Procedure:
 1. Submit electronic copies of request for substitution for consideration, consistent with requirements for Submittals. Limit each request to one proposed substitution. Include the Substitution Request form included in this project manual. Indicate responses to each prompt on the form, and provide a direct comparison of

the proposed product features to the specified product. Provide additional supporting text on additional pages if warranted.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
3. The Architect will notify General Contractor in writing of decision to accept or reject request.

3.02 PACKAGING WASTE MANAGEMENT

- A. When ordering materials and products, request to each manufacturer, fabricator, supplier, and shipper that they provide least amount of packaging that adequately and properly protects, supports and contains the items shipped, and is reusable, returnable, or recyclable.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

**SECTION 01 60 00.10
SUBSTITUTION REQUEST FORM**

Date: _____

Project: New Wentworth Hall

Architect's Project Number: _____ 0238

Contractor / Subcontractor Requesting Substitution: _____

Specification Section / Paragraph Number: _____

Item Description per Specification: _____

Proposed Substitution Product Trade name: _____

Manufacturer Name: _____

Manufacturer Address: _____

Product History New Product 1 – 5 years 5 – 10 years 10+ years

Material or Performance Differences between specified and proposed products:

Provide general description here, and provide point by point comparison of products including, but not limited to all specified requirements, product characteristics, performance features, warranties, and material and installation costs. Substitution requests received without a thorough comparison will be rejected.

Provide reason for not providing specified products:

Similar Installation References:

Project: _____

Address: _____

Owner's Representative: _____

Architect & Phone #: _____

Date of Installation: _____

Proposed substitution affects other parts of Work: No Yes, as follows:

Supporting Data Attached: Drawings Product Data Samples Tests Reports

General Contractor Certification:

I have reviewed this substitution request thoroughly, and certify the following by undersigning below:

- Proposed substitution has been fully investigated by the General Contractor and has been determined to be equal or superior in all respects to specified product.
- At a minimum, a warranty equivalent to that available for the specified product or required by the specification will be furnished for proposed substitution. Where the proposed substitution features a superior warranty the superior warranty will be conveyed to the Owner.
- The same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- The cost data associated with this substitution as stated below is complete, and a change request is attached. Claims for additional costs related to accepted substitution which may subsequently become apparent shall be waived.
- Proposed substitution does not affect dimensions and functional clearances, and I certify that the substitution has been fully coordinated with all related work and construction. Any deviations from the construction documents required to accommodate this substitution are indicated on the attached sketches and drawings.
- Payment will be made to the Architect on behalf of the design team for any required modifications to the project design, including modifications to the construction documents, additional review time, and construction administration costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects and at no additional cost to the Owner.

Savings to Owner for accepting Substitution: _____ dollars (\$ _____)

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days.

Signed by: _____ General Contractor Firm: _____

General Contractor Attachments: _____

ARCHITECT'S REVIEW AND ACTION

- Substitution accepted - Prepare full submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution conditionally accepted as noted below – Prepare full submittals in accordance with Specification Section 01 60 00 - Substitution Procedures.
- Substitution rejected - Use specified materials. The substitution has been reviewed with the Awarding Authority, and found not to be equivalent to the specified product in terms of quality, durability, performance, and/or appearance. Use specified materials.
- Substitution Request not timely - Use specified materials.

Review Comments:

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, except payment procedures.
- I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, preconstruction meetings
- B. Section 01 31 14 - Coordination.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 51 00 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.
- F. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- G. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.
- H. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- I. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- J. Section 07 84 00 - Firestopping.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

1.04 QUALIFICATIONS

- A. For survey work, employ a land surveyor registered in Massachusetts and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Massachusetts.

1.05 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- G. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.06 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Owner will locate and protect survey control and reference points.
- D. Control datum for survey is that established by Owner provided survey.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H. Utilize recognized engineering survey practices.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Cutting, coring, and patching required by the Fire Protection, Plumbing, HVAC, or Electrical Subcontractor shall be performed by that subcontractor, except as indicated in respective Filed Sub-Bid sections. Where any of those Filed Sub-Bid sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching shall be borne by the Filed Sub-Bid requiring the cutting, coring, and/or patching. All cutting, coring, and patching shall be coordinated through and by the General Contractor, and shall be performed by the subcontractor who furnished the surface or material being cut, cored, or patched. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- C. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-conforming work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

SECTION 01 70 00-4

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.08 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable General Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.09 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 79 00 - Demonstration and Training.
- B. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- C. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.10 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

- A. Execute final cleaning after Substantial Completion but before making final application for payment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Clean filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, and drainage systems.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect.
- B. Notify Architect when work is considered ready for Substantial Completion.
- C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
- D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- E. Notify Architect when work is considered finally complete.
- F. Complete items of work determined by Architect's final inspection.

3.13 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Owner may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.
- E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Aluminum and plastic beverage containers.
 - 2. Corrugated cardboard.
 - 3. Wood pallets.
 - 4. Clean dimensional wood: May be used as blocking or furring.
 - 5. Land clearing debris, including brush, branches, logs, and stumps: See Section 31 10 00 for use options.
 - 6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
- F. General Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- G. General Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- H. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- I. Regulatory Requirements: General Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to packaging, delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- E. Section 31 00 10 - Site Preparation and Clearing.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. Construction Submittals
 - 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - 2. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
 - a. Submit to Architect for Owner's review and approval.
 - b. If Owner wishes to implement any cost alternatives, the Contract Sum will be adjusted as specified elsewhere.
 - c. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
 - d. Describe as many alternatives to landfilling as possible:
 - 1) List each material proposed to be salvaged, reused, or recycled.
 - 2) List the proposed local market for each material.
 - 3) State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
 - e. Provide alternatives to landfilling for at least the following materials:

- 1) Concrete.
 - 2) Concrete masonry units.
 - 3) Asphalt paving.
3. Once Owner has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect.
 4. Waste Management Plan: Include the following information:
 - a. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - b. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - c. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - 1) List each material proposed to be salvaged, reused, or recycled.
 - 2) List the local market for each material.
 - 3) State the estimated net cost, versus landfill disposal.
 - d. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - e. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - f. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
 5. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - a. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - b. Submit Report on a form acceptable to Owner.
 - c. Landfill Disposal: Include the following information:
 - 1) Identification of material.
 - 2) Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - 3) State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - 4) Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - d. Incinerator Disposal: Include the following information:
 - 1) Identification of material.
 - 2) Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - 3) State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - 4) Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Recycled and Salvaged Materials: Include the following information for each:
 - 1) Identification of material, including those retrieved by installer for use on other projects.
 - 2) Amount, in tons or cubic yards, date removed from the project site, and receiving party.

- 3) Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
- 4) Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
- 5) Certification by receiving party that materials will not be disposed of in landfills or by incineration.
- f. Material Reused on Project: Include the following information for each:
 - 1) Identification of material and how it was used in the project.
 - 2) Amount, in tons or cubic yards.
 - 3) Include weight tickets as evidence of quantity.
- g. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 60 00 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
 - 1. Relative amount of waste produced, compared to specified product.
 - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
 - 3. Proposed disposal method for waste product.
 - 4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to packaging, delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each Filed Sub-Bid Contractor, subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Pre-bid meeting.
 - 2. Pre-construction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all Filed Sub-Bid Contractor, subcontractors, and installers.
 - 1. As a minimum, provide:
 - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.

- b. Separate dumpsters for each category of recyclable.
- c. Recycling bins at worker lunch area.
- 2. Provide containers as required.
- 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
- 4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
- 5. Locate enclosures out of the way of construction traffic.
- 6. Provide adequate space for pick-up and delivery and convenience to Filed Sub-Bid Contractors and subcontractors.
- 7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
- 8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 78 00

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Section 01 79 00 - Demonstration and Training.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit two copies of completed documents not less than three weeks prior to Substantial Completion. One copy will be returned with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit three sets of revised final documents in final form not less than one week prior to Substantial Completion.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals not later than two weeks prior to Substantial Completion.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.

- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. both horizontally and vertically at ten (10)-foot intervals and at all changes of direction.
 - 3. Provide an as-built plan of the site stamped by a Professional Land Surveyor or Professional Engineer registered in Massachusetts. An electronic version of the as-built plan in AutoCAD 2012 format shall also be provided.
 - 4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 5. Field changes of dimension and detail.
 - 6. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Additional information as specified in individual product specification sections.
- D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
- B. Complete nomenclature and model number of replaceable parts. Where additional instructions are

required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- I. Provide control diagrams by controls manufacturer as installed.
- J. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- K. Include test and balancing reports.
- L. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- D. Prepare data in the form of an instructional manual.
- E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, General Contractor and subcontractors, with names of responsible parties.
- H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- L. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- M. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, General Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

- a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
- a. Shop drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Photocopies of warranties and bonds.
- N. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
- 3.06 WARRANTIES AND BONDS**
- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
 - B. Verify that documents are in proper form, contain full information, and are notarized.
 - C. Co-execute submittals when required.
 - D. Retain warranties and bonds until time specified for submittal.
 - E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
 - F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of General Contractor and equipment supplier; and name of responsible company principal.
 - G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
 - H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - I. Asbestos Free Certification:
 - 1. As a condition of Substantial Completion in accordance with Section 01 60 00, the General Contractor shall submit a signed certificate which states that there is no asbestos in any product or material supplied to or built into the project.

END OF SECTION

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Conveying systems.
 - 6. Other items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Other items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit not less than four weeks prior to start of training.
 - 2. Revise and resubmit until acceptable.
 - 3. Provide an overall schedule showing all training sessions.
 - 4. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such a slides, hand-outs, etc.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide two extra copies of each training manual to be included with operation and maintenance data.

- D. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
 - 1. Format: DVD Disc.
 - 2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstration may be combined with Owner personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to General Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge General Contractor for personnel "show-up" time.
- E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- F. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.

2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.
 7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by General Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 02 41 00 DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. The work required under this Section shall include, but not limited to the following:
 - 1. Partial Building demolition.
 - 2. Selective demolition of built site elements.
 - 3. Removal of existing utilities and utility structures.
- B. Division of Responsibilities for Selective Demolition:
 - 1. With regard to the separation of responsibilities between the General Contractor and Filed Sub-Bid Contractors, the General Contractor (including his own forces and his selected and approved non-filed subcontractors) shall be responsible for demolition work with the following exceptions and clarifications:
 - a. The Plumbing, HVAC, and Electrical Filed Sub-Bid Contractors shall be responsible for cutting, capping, and making safe of their respective building systems and subsystems to allow for demolition by the General Contractor and his selected non-Filed Sub-Bidder subcontractors in areas of general building demolition (i.e., complete removal of buildings, structures as scheduled).

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work being performed by other sections, but related to this Section, and with which this Subcontractor must coordinate with and/or accommodate the Work of, or which contain requirements that affect the Work of this Section include the following:
 - 1. Section 00 31 00 - Available Project Information.
 - 2. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
 - 3. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
 - 4. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
 - 5. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
 - 6. Section 02 41 00 - Site Demolition.
 - 7. Section 22 00 00 - Plumbing.
 - 8. Section 26 00 00 - Electrical.
 - 9. Section 31 10 00 - Site Preparation and Clearing.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. MSBC (780 CMR). Massachusetts State Building Code Ninth Edition
 - 2. OSHA. U.S. Occupational Safety and Health Administration; www.osha.gov.
 - a. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.
 - 3. NFPA. National Fire Protection Association; www.nfpa.org.

- a. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination per Section 01 31 14, and as follows:
 - 1. Coordinate schedules of operations with Owner prior to starting work.
 - a. Schedule demolition and dismantling to cause no interference with the use of the existing buildings.
 - b. Cooperate with the Owner to reduce to a minimum all interference with normal use of the building.
- B. Preconstruction Meeting required per Section 01 70 00.

1.05 SUBMITTALS

- A. Construction Submittals:
 - 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - 2. Submit all necessary permits, certificates, and notices required by local authorities for demolition work and transport and disposal of debris.
 - 3. Site Plan: Showing:
 - a. Areas for temporary construction and field offices.
 - 4. Submit demolition procedures and operational sequence for review and acceptance by Architect. Include in schedule coordination for shut off, capping, and continuation of utility services.
 - 5. Provide a detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on site operations.
- B. Closeout Submittals:
 - 1. Submittal Procedures per Section 01 78 00, and as follows:
 - a. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.06 EXISTING UTILITY SERVICES:

- A. Arrange and pay for disconnecting, removing, and capping utility services within areas of demolition and to the main line.
- B. Place markers to indicate location of disconnected services. Identify service lines and capping locations.

1.07 FIELD CONDITIONS - GENERAL DEMOLITION

- A. Occupancy: Structures (and parts of structures) to be demolished will be vacated and use discontinued prior to start of work.
- B. Condition of Structures: Owner assumes no responsibility for actual condition of structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work.
- C. Explosives: Use of explosives will not be permitted.
- D. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from AHJ. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
 - 2. Maintain safe access around demolition to occupied building areas for Owner, building users, service, fire and police vehicles.
 - 3. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent damage to adjacent buildings, structures, and other facilities and injury to persons.
 - 4. Erect temporary covered passageways if so directed by Owner or AHJ.
- E. Damages: Promptly repair damages caused to adjacent facilities by demolition operations.

- F. Utility Services:
 - 1. Arrange for disconnecting and sealing utilities serving structure to be demolished, prior to start of demolition work. This includes complete removal to the main source and all requirements of Dedham Westwood Water, DPW and Mss DOT
 - 2. Shut off and cap water service to building areas to be demolished.
- G. Utility Services: Do not start demolition work until utility disconnections have been completed and verified in writing.
- H. Remove and legally disposal of liquids and chemicals that are contained within building systems and fixed equipment, such as heating system glycol and refrigeration system Freon.

1.08 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.

PART 2 PRODUCTS

2.01 MATERIALS

PART 3 EXECUTION

3.01 SCOPE

- A. Remove the entire building as designated in the drawings after panelization at 280 Washington Street, Westwood, MA.
- B. Remove existing site features as indicated in the drawings.

3.02 Remove other items indicated, including AHU in back of building

3.03 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with other requirements specified in Section 01 70 00.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permit.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- F. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.04 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- E. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- F. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.05 GENERAL DEMOLITION

- A. General: Conduct all demolition in a safe and secure manor.
 1. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structures to remain, be demolished, or that are adjacent.
 2. Provide protection from damage from weather to any existing building components that are left exposed as a result of demolition or removal.
- B. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air. Comply with governing regulations pertaining to environmental protection.
 1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.
- D. Building Demolition: Demolish buildings completely and remove from site. Use such methods as appropriate to complete work within limitations of governing regulations. (Subject to approval of the Architect and Owner, approved, processed ABC rubble meeting the requirements of Section 31 00 00 may be used for fill on site except in areas subject to Wetland Regulations per Conservation Commission Order of Conditions.)
 1. Proceed with demolition in systematic manner, from top of structure to ground. Complete demolition work above each floor or tier before disturbing supporting members on lower levels.
 2. Remove structural framing members and lower to ground by hoists, derricks, or other suitable methods.
 3. Locate demolition equipment throughout structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.
- E. Vermin Control: Employ a certified, licensed exterminator and treat entire area of building demolition and removal in accordance with governing health regulations for rodent and insect control. Use of chemicals or heavy metals hazardous to non-target species are prohibited.
- F. Work shall be removed as indicated and as specified, for class of work concerned, even though removal as such is not specified in full.
- G. All materials not indicated or specified to be reused or salvaged shall be removed from site.
- H. Promptly repair damage to existing structure caused by the work of this Contract at no cost to the Owner.
- I. Protect from public below grade areas and voids resulting from demolition of structures with barriers and warnings against illegal access.

3.06 DEBRIS AND WASTE REMOVAL

BID #ECON-21-B-01

New Wentworth Hall

100% Construction Documents

SECTION 02 41 00 4

- A. Remove debris, junk, and trash from site and building daily. Burning of materials from demolished structures will not be permitted on site.
- B. Each of the following sub-trades shall provide their own dumpster to accommodate removed materials related to the sub-trade: Roofing.
- C. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.
- D. Transport materials removed from demolished structures and legally dispose off site.
- E. Leave site in clean condition, ready for subsequent work.
- F. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 02 95 00

AS-BUILT SITE SURVEY

PART 1 GENERAL

1.01 CONDITIONS AND REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section
- B. Examine all drawings and all other Sections of the specifications for requirements therein affecting the work of this trade.
- C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

- A. The work in this Section consists of providing corrected as-built construction documents which reflect the actual as-built site conditions. Corrected documents shall include any adjustments to:
 - 1. The actual layout and outline of all buildings, pavements, curbing, surfaces and visible site improvements including plantings.
 - 2. Site topography at 1-foot contour intervals for all disturbed areas. Spot grades shall be provided on all pavements, walkways, ADA access ramps, and parking spaces, all building finish floors, at all doorway locations, and at all building entrances. Spot grades shall be provided at intervals not in excess of 20 feet and at all observable breaks or changes in grade.
 - 3. Installed location and elevations (e.g. rims, inlet and outlet inverts, sumps, top of outlet structures, top and bottom of all tanks and tees, top and bottom of all chambers) of all site utilities including, but not limited to:
 - a. Storm drainage system including drainage pipes, roof drains, roof drainage recycle tank and pump station, catch basins, manholes, subsurface infiltration system and stormwater treatment systems.
 - b. Sewer system including all sanitary and special waste sewer pipes, vent pipes, backwash tank, membrane feed tank, grease trap, pumps, bends, connections and all other sanitary components.
 - c. Water and fire protection including all valves, hydrants, tees, bends and connections.
 - d. Overhead and underground electric and telecommunications banks (telephone, fire alarm and cable tv) with all manholes, transformers, standby generators and handholes.
 - e. Underground natural gas supply system including all valves, bends and connections and the gas meter.
 - f. Underground and above ground components of the HVAC system including above ground (at grade) HVAC unit and piping.
- B. See sections 01 70 00 Execution and Closeout Requirements and 01 78 00 Closeout Submittals for additional requirements.

1.03 RELATED WORK

- A. Section 01 70 00 Execution and Closeout Requirements
- B. Section 01 78 00 Closeout Submittals
- C. Section 31 00 00, Earthwork.
- D. Section 33 10 00, Water Distribution.
- E. Section 33 30 00, Sanitary Sewer System.
- F. Section 33 40 00, Storm Drainage System.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.01 CORRECTED AS-BUILT DOCUMENTS

- A. At the completion of correcting all as-built construction documents, the contractor shall submit to the Architect for review, two prints of all as-built documentation and an electronic copy in AutoCAD version 2015. All field books, computer files, data collector files and computations required for the above described work shall be kept in a neat

and orderly manner, clearly indexed, and shall be available for inspection and reference at least three years after the completion of the project.

- B. The responsible person preparing the as-built documentation shall be a Registered Land Surveyor licensed to practice in the Commonwealth of Massachusetts. All drawings shall be signed and sealed by the Massachusetts Registered Land Surveyor who is responsible for the as-built documentation.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Provide the following Concrete work as indicated by the Drawings and as specified:
1. Furnishing, placing, finishing, curing and protection of all plain and reinforced concrete (normal weight and light weight), above and below grade, for buildings and site-related cast-in-place concrete, including paving, etc., as indicated in Civil/Landscape Drawings; and, housekeeping pads and curbs as required by and indicated in HVAC, Plumbing and Electrical Drawings.
 2. Furnishing and erection of formwork, and removal of same.
 3. Furnishing and placing of reinforcing steel, including welding to structural steel and related positioning and securing all embedded accessories.
 4. Furnishing and installation of admixtures, concrete surface conditioners, wedge inserts, masonry and dovetail anchors, flashing reglets and similar items in conjunction with concrete work.
 5. Furnishing and installation of approved non-shrink cement grout under base and leveling plates.
 6. Furnishing and installation of vapor retarders or barriers under slabs cast on grade.
 7. Installation of items furnished by other Sections such as anchors, bolts, plates, and embedded items required to be cast into concrete.
 8. Make provisions in forms for proper location and installation of pipe sleeves, duct openings, keys, chases, and electric boxes, as required by other trades.
 9. Accessories as needed for a complete installation.
- B. Intent of Work
1. Except as specified otherwise herein, concrete shall be batched, mixed, placed, tested and cured in accordance with the American Concrete Institute's "Specifications for Structural Concrete for Buildings" ACI 301.
 2. Subcontractor shall schedule his Work and notify all trades in ample time so that provisions for their Work can be made without delaying the progress of the Project.
 3. It is the intention of the Drawings and Specifications to produce concrete which will present an acceptable finished appearance. Imperfections of material or Workmanship shall be corrected as directed by the Engineer's direction, at no additional cost to the Owner.
 4. All of the Work that is to be inserted in the forms for attachment of other work is not described in detail. Sub- Contractor shall carefully examine all drawings and other Sections of these specifications for the extent and detail of all such work and coordinate this work with other trades.
 5. The Contractor shall be responsible to insure that all concrete surfaces are completely free of any conditions which will adversely affect its finished appearance or the application of a specified finish.
 6. Failure to comply with these requirements will require removal of sufficiently large Section of the Work, as determined by the Architect and Engineer, in order to properly integrate the Section to be replaced with the architectural and structural requirements of the total project. All such removal and replacement shall be made at the expense of the Subcontract at no additional cost to the Owner.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this trade contractor, General Contractor, material suppliers and all other persons furnishing labor and materials under this Section. General Conditions, Supplementary Conditions, and applicable parts of Division 01 are included as part of this section.

- B. Carefully examine all of the Contract Documents for requirements which affect the Work of this Section.
- C. Work described in other Sections which contain requirements applicable to the Work of this Section, or, with which this subcontractor must coordinate the Work of this Section include, but are not limited to the following:
 - 1. Section 01 45 23 – Structural Testing and Inspecting Services
 - 2. Section 03 05 10 – Concrete Water Vapor Reduction Admixture: admixture to be furnished by this General Contractor.
 - 3. Section 04 20 00 - Unit Masonry: reinforcing placement for CMU partitions.
 - 4. Section 05 12 00 - Structural Steel Framing
 - 5. Elevator Pit sheet waterproofing
 - 6. Section 05 15 00 – Stud Shear Connectors
 - 7. Section 07 90 05 - Joint Sealers
 - 8. Division 22 – Plumbing
 - 9. Division 23 – Heating, Ventilating and Air Conditioning (HVAC)
 - 10. Division 26 - Electrical

1.03 REFERENCE STANDARDS

- A. Except as modified by the requirements specified herein and/or the details on the Drawings, all Work included in this Section shall conform to the applicable provisions of the following codes, standards and references as well as those specified in Section 01 42 00 - References and in the latest edition of the Massachusetts State Building Code (MSBC):
 - 1. ASTM International; www.astm.org
 - a. A185/A185M-07 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - b. A497/A497M-07 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
 - c. A615/A615M-07 – Standard Specification for Deformed and Plain Billet-steel Bars for Concrete Reinforcement
 - d. A706/A706M-06a – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
 - e. C33-03 – Standard Specifications for Concrete Aggregates
 - f. C94/C94M-06 – Standard Specification for Ready Mix Concrete
 - g. C150-05 – Standard Specification for Portland Cement
 - h. C171-92 – Standard Specification for Sheet Materials for Curing Concrete
 - i. C260-06 – Standard Specification for Air-entraining Admixtures for Concrete
 - j. C309-93 – Standard Specification for Liquid Membrane-forming Compounds for Curing Concrete
 - k. C330-05 – Lightweight Aggregates for Structural Concrete
 - l. C494/C494M-05a – Standard Specification for Chemical Admixtures for Concrete
 - m. C618-05 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
 - n. C685/C685M-01 – Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
 - o. C989/C989M-12a – Standard Specification for Slag Cement for Use in Concrete and Mortars
 - p. C1017/C1017M-03 – Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete
 - 2. ACI. American Concrete Institute; www.concrete.org
 - a. ACI 117-90 (Reapproved 2002) – Specifications for Tolerances of Concrete Construction and Materials

- b. ACI 121R-04 – Quality Management System for Concrete Construction
- c. ACI 207.1R-96 – Mass Concrete
- d. ACI 211.5R-01 – Guide for Submittal of Concrete Proportions
- e. ACI 212.3R-04 – Chemical Admixtures for Concrete
- f. ACI 212.4R-04 – Guide for the Use of High-Range Water-Reducing Admixtures (Superplasticizers) in Concrete
- g. ACI 213R-03 – Guide for Structural Lightweight Aggregate Concrete
- h. ACI 224R-01 – Control of Cracking in Concrete Structures
- i. ACI 224.3R-95 (Reapproved 2001) – Joints in Concrete Construction
- j. ACI 233R-03 – Slag Cement in Concrete and Mortar
- k. ACI 301-05 – Specifications for Structural Concrete for Buildings
- l. ACI 302.1R-04 – Guide for Concrete Floor and Slab Construction
- m. ACI 302.2R-06 – Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
- n. ACI 303R-04 – Guide to Cast-In-Place Architectural Concrete Practice
- o. ACI 303.1-97 – Standard Specification for Cast-In-Place Architectural Concrete
- p. ACI 304R-00 – Guide for Measuring, Mixing, Transporting and Placing Concrete
- q. ACI 304.2R-96 – Placing Concrete by Pumping Methods
- r. ACI 304.5R-91 (Reapproved 1997) – Batching, Mixing, and Job Control of Lightweight Concrete
- s. ACI 305R-88 (Reapproved 2002) – Hot Weather Concreting
- t. ACI 306R-88 (Reapproved 2002) – Cold Weather Concreting
- u. ACI 308R-01 – Standard Practice for Curing Concrete
- v. ACI 309R-96 – Guide for Consolidation of Concrete
- w. ACI 309.3R-92 (Reapproved 1997) – Guide to Consolidation of Concrete in Congested Areas
- x. ACI 315 – ACI Detailing Manual - 2004
- y. ACI 318-08 – Building Code Requirements for Structural Concrete
- z. ACI 336.3R-93 (Reapproved 1998) – Design and Construction of Drilled Piers
- aa. aa. ACI 347-04 – Guide to Formwork for Concrete
- bb. ACI 351.1R-99 – Grouting between Foundations and Bases for Support of Equipment and Machinery
- cc. ACI 355.2-04 – Evaluating the Performance of Post-Installed Mechanical Anchors in Concrete
- dd. ACI 503R-93 (Reapproved 1998) – Use of Epoxy Compounds with Concrete
- ee. ACI 503.4-92 (Reapproved 2003) – Standard Specification for Repairing Concrete with Epoxy Mortars
- ff. ACI 504R-90 (Reapproved 1997) – Guide to Sealing Joints in Concrete Structures
- gg. ACI 544.3R-93 (Reapproved 1998) – Guide for Specifying, Proportioning, Mixing, Placing, and Finishing Steel Fiber Reinforced Concrete
- hh. ACI 546R-04 – Concrete Repair Guide
- 3. ANSI – American National Standards Institute
 - a. ANSI/ASCE 9-91 – Standard Practice for the Construction and Inspection of Composite Slabs
- 4. AWS – American Welding Society
 - a. AWS D1.1-04 – Structural Welding Code-Steel
 - b. AWS D1.4-98 – Structural Welding Code-Reinforcing Steel

5. CRSI (MSP) – Manual of Standard Practice (28th edition)
6. MSBC – The latest currently enforced edition of the Massachusetts State Building Code
7. IBC – International Building Code, 2009, as amended by the MSBC.
8. ADA – Americans with Disabilities Act 2010.
9. MAAB – Massachusetts Architectural Access Board.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination per Section 01 31 14 - Coordination, and as follows:
 1. Coordinate concrete testing with Independent Testing Agency.
 2. Coordinate concrete inserts.
- B. Pre-installation Meetings required per Section 01 30 00 – Administrative Requirements for foundations and slabs, and as follows: Installer of the Work of this Section is also required to attend pre-installation conference specified under Section 04 20 00 – Unit Masonry.

1.05 SUBMITTALS

- A. Coordination per Section 01 30 00 – Administrative Requirements, and as follows:
 1. Coordinate concrete testing with Independent Testing Agency.
 2. Coordinate concrete inserts with all trades providing them to this subcontractor for installation.
- B. General
 1. Review of submittals is for general conformance with the design concept of the project and information shown on the contract documents only. The General Contractor is responsible for conforming, correlating and coordinating dimensions in the field for tolerance, clearances, quantities, fabrication and installation processes, means and methods of construction, coordination of this work with other trades and performing work in a safe and satisfactory manner.
 2. Prior to final approval of Shop Drawings for exposed architectural concrete surfaces the Mock-up specified herein shall be completed and approved. Any modifications of the Mock-up formwork shall be incorporated into the Shop Drawings and other submittals.
- C. Shop Drawings: Comply with ACI 315 for reinforcement detailing, fabricating, bending, and placing concrete reinforcement. Show bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement.
 1. All reinforcing Shop Drawings for concrete and masonry walls shall be shown on wall elevations with a scale of 1/4 in. = 1 ft. – 0 in.
 2. Include special reinforcing required for openings through concrete structures.
 3. Submit shop drawings of all formwork for architecturally exposed concrete (Concrete Exposed to View) showing cone tie patterns.
 4. Submit Drawings of formwork design for review of form types, location of joints and ties, details of reveals, chamfers, textured surfaces and other visual aspects of concrete.
 5. Submit detailed drawings showing locations of all concrete joints (construction, contraction, and expansion), curbs, depressions, sleeves and openings.
 6. Submit plans and other details showing sequence of concrete pours. This will be reviewed only for impact on the performance of the completed structure.
 7. Submit detail drawings indicating position of waterstops and details to be used for all water tight construction.
 8. Submit shop drawings that include wall elevations, details and dimensions for all walls, footings and any other concrete element.
- D. Concrete Curing and Protection:
 1. Submit to the Architect/SER in accordance with the requirements of the Contract Documents, detailed methods proposed for use for curing and protection prior to commencement of concrete work, including

- a. Cold and Hot Weather protection plan
 - b. Curing protection plan for footings, walls, slabs-on-grade, slabs-on-deck, beams, columns, etc.
- E. If conveying concrete by pump is intended, submit related data regarding concrete materials, pumping device and methods to Architect. Consider effects of pump loss if lightweight concrete will be pumped, provide high range water reducer (HRWR), rather than water, to maintain workability. When HRWR admixtures will be used, submit information from manufacturer and batching plant on dosage amounts.
- F. Concrete Mix Design: Submit proposed mix designs for each class of concrete indicated in section 2.02. Include the following:
 - 1. Copies of mix designs: Mix designs shall be prepared by an independent testing laboratory.
 - 2. The mix design submittal shall list:
 - a. All materials and admixtures and their proportions.
 - b. Water and cement content, water cementitious material ratio, slump and combined aggregate gradation (percent retained on every sieve size).
 - c. Compressive strength documentation of how the strength was determined.
 - d. Information on concrete materials as per paragraph 4.1.2.3 of ACI 301.
 - e. Whether mix is appropriate for pumping.
 - f. Indicate where each mix will be used.
 - 3. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix design. Include all calculations and tests required by ACI 318 Section 5.3.
 - 4. Test results of total chloride in content.
 - 5. Where shrinkage limit is specified, submit shrinkage test results.
 - 6. For lightweight aggregate used, submit test results per ASTM C330.
 - 7. For normal weight aggregate, submit test results per ASTM C33.
- G. Product Data:
 - 1. Submit product data for proprietary materials, the following products and those requested by the Architect and/or SER showing compliance with project specifications, manufacturer's recommendations, as well as known limitations. Provide certification that the following materials conform to the standards referenced in this section including, but not limited to:
 - a. Reinforcement
 - b. Form work and accessories
 - c. Admixtures
 - d. Cementitious materials used in mix design
 - e. Patching compounds
 - f. Water-stops
 - g. Joint systems
 - h. Curing materials
 - i. Dry-shake finish materials
 - j. Non-shrink grout
- H. Certifications: Submit certification by the manufacturers that each admixture conforms to requirements specified in this section and that the admixtures are compatible with one another.
- I. Submit cement mill tests.
- J. Upon completion of the concrete Work, deliver the records of concrete placement and the concrete batch tickets to the Architect.
- K. Warranties:

Provide copies of manufacturers' actual warranties for all materials to be furnished under this Section,

clearly defining all terms, conditions and time periods for the coverage thereof.

1.06 QUALITY ASSURANCE

A. Qualification of Workmen:

1. Provide one or more persons who shall be present at all times during the execution of this portion of the Work and who shall be thoroughly trained and experienced in the types of concrete specified and who shall direct all work performed under this Section.
2. The individual directing this work shall have at least five years of foreman experience with 'As-cast' Architectural concrete.
3. For finishing of exposed surfaces of the exposed concrete, use only thoroughly trained and experienced journeymen concrete finishers.
4. Product(s) Technical Representative: Provide services of a qualified technical representative approved by reinforcement manufacturer to instruct concrete supplier in proper batching and mixing procedures

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with ACI, concrete plant's instructions and recommendations, Section 01 60 00, and as follows:

1. Handle and store materials separately in such manner as to prevent intrusion of foreign matter, segregation, or deterioration.
2. Do not use frozen materials or those containing ice.
3. Store bags of concrete or grout indoors.
4. Remove improper and rejected materials immediately from point of use.
5. Cover materials, including steel reinforcement and accessories, during construction period.
6. Stockpile concrete constituents properly to assure uniformity throughout project.

PART 2 PRODUCTS

2.01 CONCRETE CONSTITUENTS

- A. Cement: Shall be American-made Portland Cement; and conform to chemical and physical requirements of ASTM C150 for Type I for exposed concrete and Type II, low alkali, standard gray color for all other work.
1. 30 percent replacement of cementitious materials with fly ash or slag is to be used to comply with the sustainable design requirements, except for all slabs.
 - a. Fly ash or slag used in interior concrete slab-on-grade or elevated slab construction shall be 15 percent replacement of cement.
 2. High early strength cement conforming to ASTM C150 Type III may only be used with permission of the SER given in writing.
 3. Do not use air-entraining cements.
- B. Normal Weight Fine Aggregate: Shall be washed, inert, natural sand conforming to ASTM C33.
- C. Normal Weight Coarse Aggregate: Shall be well-graded crushed stone or washed gravel conforming to ASTM C33.
- D. Water: Shall be from approved source, potable, clean and free from oils, acids, alkali, organic matter and other deleterious material.
- E. Admixtures:
1. Normal Range Water-reducing Agent: ASTM C494, Type A. Water-reducing agent shall be by same manufacturer as air-entraining agent.
 - a. Acceptable Products and Manufacturers:
 - 1). "Eucon WR-91" by Euclid Chemical
Company

- 2). "ZYLA610" by W. R. Grace & Co.
 - 3). "Pozzolith" Series by BASF Corporation
 - 4). Substitution Limitations: See Section 01 60 00 - Product Requirements.
2. Mid-Range Water Reducing Agent: ASTM C494, Type A Water-reducing agent shall be by same manufacturer as air-entraining agent.
 - a. Acceptable Products and Manufacturers: 1). "Eucon MR" by Euclid Chemical Co. 2). "MIRA62" by W.R. Grace & Co.
 - 3). "PolyHeed" Series by BASF Corporation
 - 4). Substitution Limitations: See Section 01 60 00, Product Requirements.
 3. High Range Water Reducing Agent / Retarder: ASTM C494, Type F or Type G Water-reducing agent shall be by same manufacturer as air-entraining agent.
 - a. Acceptable Products and Manufacturers:
 - 1). "Eucon-37 (F)" or "Eucon-537 (G)" by Euclid Chemical Co. 2). "WRDA (F)" or "Daracem-100" by W.R. Grace & Co.
 - 3). "Glenium" Series or "Rheobuild 1000" by BASF Corporation
 - 4). Substitution Limitations: See Section 01 60 00, Product Requirements.
 4. Air-entraining agent: ASTM C260. In no instance shall air percent content exceed five percent by volume.
 - a. Acceptable Products and Manufacturers:
 - 1). "Eucon Air Mix" by Euclid Chemical Co. 2). "Darex AEA" by W. R. Grace & Co.
 - 3). "Micro Air" by BASF Corporation
 - 4). Substitution Limitations: See Section 01 60 00, Product Requirements.
 5. Concrete Water Vapor Reduction Admixture: Per the requirements of Section 03 05 10.

2.02 CONCRETE MIXTURES

- A. Footings and Foundation Walls: Proportion normal weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3000 PSI at 28 days.
 2. Maximum water – cementitious material ratio: 0.50.
 3. Sump Limit: 4 in., plus or minus 2 in.
 4. Air Content: four percent, plus or minus one percent at point of delivery for ¾ in. nominal maximum aggregate size (applies to pile caps, footings and foundation walls and all other concrete exposed to freeze/thaw action).
- B. Slabs-on-Grade: Proportion normal weight concrete mixture as follows:
 1. Minimum Compressive Strength: 4000 PSI at 28 days.
 2. Maximum water – cementitious material ratio: 0.45.
 3. Sump limit: 4 in., plus or minus 1 in.
 4. Air Content: four percent, plus or minus one percent at point of delivery for ¾ in. nominal maximum aggregate size (applies to footings and foundation walls and all other concrete exposed to freeze/thaw action).

- C. Topping Slabs: Proportion structural lightweight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4000 PSI at 28 days.
 - 2. Calculated Equilibrium Unit Weight: 110 lb. /cu. ft., plus or minus 3 lb. / cu. ft. as determined by ASTM C 567.
 - 3. Maximum water – cementitious material ratio: 0.45.
 - 4. Sump Limit: 4 in., plus or minus 1 in.
 - 5. Air Content: four percent, plus or minus one percent at point of delivery for ¾ in. nominal maximum aggregate size (applies to pile caps, footings and foundation walls and all other concrete exposed to freeze/thaw action).
- D. Water reducing and air-entraining agents shall be used in all concrete. Total entrapped air plus entrained air in freshly mixed concrete shall be four percent (Plus or Minus one percent) of volume of concrete with required strengths maintained.
 - 1. Use a high range water reducing agent for all concrete for slabs-on-grade and slabs-on-metal deck.
 - 2. Use a mid-range water reducing agent in all pumped concrete with a water/cement ratio greater than 0.40.
 - 3. Use a high range water reducing agent in concrete with a water cement ratio of 0.40 or less.
- E. All dry weight of normal weight concrete shall be 150 pcf.
- F. All dry weight of lightweight concrete shall be 113 pcf.
- G. In lieu of preparing mix design in laboratory, a production mix may be proposed provided a record of at least 30 consecutive strength tests is submitted to the Architect and SER for review. Tests shall be from similar mix used in last 12 months and average compressive strength shall be consistent with standard deviation of compressive strengths permitted in ACI 318, Chapter 4, paragraph 4.3, "Proportioning on the basis of field experience".
- H. Any deviation from approved mix design, which the General Contractor deems desirable under certain project conditions, will not be allowed without examination and written review by the SER.
 - 1. Costs of additional testing by the SER and/or the Testing Agency shall be paid for by the General Contractor, at no additional cost to the Owner.
- I. For concrete fill in metal pan stairs, use a 3,000 psi mix with 3/8 in. pea stone aggregate. Provide a water to cement ratio of .45 and a maximum recommended slump range of 1 in. to 3 in.

2.03 FORM MATERIALS

- A. Exposed Concrete Surfaces: Shall conform to ACI-301, Chapter 13.
- B. Forms for concrete flat surfaces exposed to view in finished work shall be new Class I High Density Overlay Plyform, exterior grade, not less than five ply nor less than 5/8 in. thick conforming to U.S. Product Standard P-1- 66.
 - 1. All form joints shall be sealed with approved non-staining sealant to be watertight.
- C. Concrete Surfaces Not Exposed to View: Forms for concrete surfaces not exposed to view in finished work shall be made of wood, metal or other materials subject to review of the Architect and the SER, and shall conform to ACI 301, Chapters Four and Ten.
- D. Form Ties and Spreaders: Ties for walls in areas exposed to view in finish work.
 - 1. Basis-of-Design Product and Manufacturer: Type SPCH - Stainless Steel "Snap-Ties" by Richmond Screw Anchor Co., or a SER acceptable equivalent subject to compliance with requirements from one of the following manufacturers:
 - a. Superior Concrete Accessories, Inc.
 - b. Dayton Sure-Grip and Shore Co.
 - c. Substitution Limitations: See Section 01 60 00, Product Requirements.
 - 2. Wire ties shall not be used.
 - 3. Where concrete is to be left exposed, painted or plastered, ties shall have removable tapered, plastic cones 1 in. outside diameter.

4. Ties for walls below grade and in areas not exposed to view in finished work shall be snap ties with removable cones, and shall incorporate water seal washer.
- E. Form Release Agent: Shall be of a non-staining and non-emulsifiable type, or equal approved by the SER. Form release agent shall not impart any stain to concrete nor interference with adherence of any finish material to be applied to any concrete surface.

2.04 REINFORCEMENT AND ACCESSORIES

- A. Recycled Content of Steel: Use maximum available percentage of recycled steel. Reinforcing steel incorporated into the work shall contain not less than 95 percent of recycled scrap steel.
- B. Reinforcing Steel Bars: Shall be newly rolled billet steel conforming to ASTM A 615 (Grade 60 unless noted). Bars shall be bent cold as required. Reinforcing bars being welded shall conform to ASTM A 706, Grade 60.
- C. Welded Wire Fabric ASTM A 185: All welded wire fabric shall be supplied in sheets and is to be used in slabs on grade and on deck as noted. No fiber mesh substitutes will be permitted.
- D. Reinforcement Accessories: Shall conform to Product Standard PS7-766, National Bureau of Standards, Department of Commerce, Class C. Reinforcement accessories shall include spacers, chairs, ties, slab bolsters, slips, chair bars, and other devices for reinforcement.
 1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Hohmann & Bernard, Inc.
 - b. Superior Concrete Accessories, Inc.
 - c. Dayton Sure-Grip and Shore Co.
 - d. R.K.L. Building Specialties Co., Inc.
 - e. Substitution Limitations: See Section 01 60 00, Product Requirements.
 2. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs. Concrete bricks may be used to support reinforcing steel where application allows.
- E. Fibrous Reinforcement for Slab-On-Grade Concrete:
 1. Provide fibrous reinforcement for all interior slabs-on-grade where no other reinforcement is specified.
 2. Acceptable Material: Collated fibrillated 100 percent virgin homopolymer polypropylene fibrous bundles used for secondary reinforcement at slab-on-grade applications, conforming to ASTM C 1116 and ASTM C 1018, Fiber length $\frac{3}{4}$ in. – 1 $\frac{1}{2}$ in., specific gravity 0.9.
 - a. Acceptable Products and Manufacturers:
 - 1). Grace Fibers by W. R. Grace & Company
 - 2). Fibermesh by Propex Concrete Systems Corporation
 - 3). Forta Econo-Mono by Forta Corporation
 3. Quality Assurance: Product(s) technical representative shall instruct concrete supplier in proper batching and mixing procedures.
 - a. Submit copy of field report to the Architect indicating conformance.
 4. Mixing: Add fibrous concrete reinforcement when concrete is batched using quantities approved for each type of concrete required. Disperse fibrous reinforcement completely and uniformly throughout batched concrete, strictly following manufacturer's instructions and recommendations.
 5. Fiber-Reinforced Concrete Test: Specimens prepared for quality control/material acceptance shall be vibrated externally per ACI-544.1R recommendations.
 6. Requirements: Do not use tined rakes for conveying fibrous reinforced concrete. To improve movement of fibrous reinforced concrete through the grate on the concrete pumping equipment, elevate ready mix truck chute approximately 14 in. above grate.

2.05 MISCELLANEOUS MATERIALS

A. Under-slab Vapor Retarder:

1. Non-woven plastic geo-membrane sheet product meeting or exceeding the requirements of an ASTM E-1745 vapor retarder.
2. Performance Requirements:
 - a. Permeance of less than 0.01 Perms [grains / (ft² – hr – inHg)] as tested in accordance with ASTM E 1745 Section 7.
 - b. Other performance criteria:
 - 1). Strength: Meet ASTM E 1745 Class A requirements.
 - 2). Tensile Strength: 45 pound-feet / in per ASTM D-882 or E-154
 - 3). Puncture Resistance: 2200 grams per ASTM D-1709
 - 4). Thickness: 10 mils. Minimum
3. Manufacturer:
 - a. Basis of Design: Stego Wrap Vapor Barrier (10 –mil.) by Stego Industries LLC, (877) 464-7834; www.stegoindustries.com.
 - b. Other acceptable products:
 - 1). Perminator (10 mil) by W. R. Meadows, Inc. (800) 342-5976; www.wrmeadows.com.
 - 2). Barrier-Bac VB-350 (16 mil) by Inteplast Group, (877)535-0555, www.BarrierBac.com.
 - 3). Vapor Block (10 mil) manufactured by Raven Industries, (800) 635-3456; www.ravenind.com.
 - 4). Griffolyn (10 mil) manufactured by Reef Industries, (800) 231-6074; www.reefindustries.com.
 - 5). Substitutions: None permitted.
4. Accessories:
 - a. Seam tape, mastic, piping boots, termination strips and other accessory items as recommended by the manufacturer.

B. Curing Mediums:

1. Absorptive Cover: Burlap cloth made from jute or Kenaf, weighing approximately nine ounces per square yard complying with AASHTO M182, Class 2.
2. Moisture Retaining Cover: One of the following complying with ASTM C171:
 - a. Waterproof paper,
 - b. Polyethylene film,
 - c. Polyethylene-coated burlap.

C. Non-shrink Cement Grout: Shall be ready-to-use non-metallic aggregate product requiring only addition of water at job site. Grout shall be easily workable and shall have no drying shrinkage at any age. Compressive strength of grout (2 x 2 in. cubes) shall not be less than 5000 psi at seven days and 7500 psi at 28 days.

1. Manufacturer List. Subject to compliance with requirements, provide products by one of the following:
 - a. W. R. Grace & Co
 - b. Sonneborn Building Products, Inc. / BASF
 - c. Sakrete Company
 - d. Substitution Limitations: See Section 01 60 00, Product Requirements.

D. Threaded Inserts and Dowels: Shall be structural concrete insert of type shown on Drawings. Galvanize all components in accordance with ASTM A 153, unless indicated to be stainless steel.

1. Manufacturer List. Subject to compliance with requirements, provide products by one of the following:
 - a. Hohmann and Barnard, Inc.
 - b. Richmond Screw Anchor Co.
 - c. Superior Concrete Accessories Inc.
 - d. Substitution Limitations: See Section 01 60 00, Product Requirements.
- E. Waterstops: Provide flat, dumbbell type or center bulb type waterstops at construction joints, or other joints as indicated on the Drawings.
 1. Waterstops shall be constructed of thermoplastic in accordance with The Corps of Engineers CRD-C572.
 2. Waterstops shall be continuous using splices as recommended by the manufacturer so as to prevent the passing of water through the joint.
- F. Preformed Joints: Install as per the manufacturer's instruction the following material to form the control joint at all slabs on grade.
 1. Acceptable Products and Manufacturers:
 - a. Keyed Kold Joint by The Burke Co., San Mateo, California.
 - b. Kold Seal Zipper Strip by Vinylex Corporation, Knoxville, Tennessee
 2. Preformed Control Joints by W. R. Meadows.
 - a. Substitution Limitations: See Section 01 60 00, Product Requirements.
- G. Under-slab Rigid Insulation: As specified at Section 07 21 00 – Thermal Insulation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
 1. Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, substrates, structural support, utility connections, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required by each manufacturer, and ready to receive Work.
 - b. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 ERECTION OF FORMWORK

- A. Use forms for all concrete, including footings, except as otherwise permitted in writing by Architect and/or the SER. Design and construct concrete forms to withstand all forces, including construction live loads imposed upon them during placing and curing of concrete, and with adequate bracing to hold them within specified tolerances for lines and grades shown on Drawings as specified under ACI 347.
- B. Before reinforcement is placed on or against formwork, formed surfaces coming in contact with fresh concrete shall be cleaned and then treated with approved form release agent.
- C. Before form materials can be re-used, surfaces that will be in contact with freshly cast concrete shall be thoroughly cleaned, damaged areas repaired and projecting nails withdrawn. Re-use of form material shall be subject to review by the Architect and/or the SER.
- D. Tolerances for formed surfaces: Produce formed concrete work to the dimensions shown on the Drawings within the tolerances given in ACI 347.78, Article 3.31. The tolerances are the maximum allowable dimensional departure from the planes and points established by the Drawings, subject to the maximum rate of change in plane equal to the tolerance dimension and distance first stated in Article 3.3.1 for each category of work.
- E. Tolerances for Architecturally exposed concrete formed surfaces: Surfaces permanently exposed to view shall be considered "Class A" finish, with no abrupt or gradual surface irregularity in excess of 1/8 inch within a 5 foot measured dimension.
 1. Abrupt irregularities are defined to include offsets and fins resulting from displaced, mismatched or misplaced forms, surface defects in form materials, sheathing or liners, and voids within

concrete due to improper vibrating.

2. Gradual irregularities are defined to include those resulting from warping, deflection or bending of formwork or similar variations from planeness. Gradual irregularities will be measured with a straightedge for flat surfaces.
3. Rejection of Exposed Formed Concrete: Any Architectural Concrete that does not conform to the requirements of ACI 347, Article 5.2 for appearance and quality or the requirements stated herein, when forms are removed, is subject to rejection by the Architect and/or the SER. Rejected work shall be removed and replaced at the General Contractor's expense.

3.03 PLACING OF REINFORCEMENT

- A. Reinforcement shall be placed in accordance with requirements of CRSI (MSP) "Placing Reinforcing Bars" and with further requirements below.
- B. Heating, bending, tack welding, curing or substituting reinforcement in field is PROHIBITED, other than as shown on Drawings.
- C. Reinforcement shall be continuous through construction joints, unless otherwise indicated on Drawings.
- D. Reinforcement shall be spliced only in accordance with requirements of Contract Documents. Splices of reinforcement at points of maximum stress shall generally be avoided. Welded wire fabric shall lap 6 in. inches or one space, whichever is larger, and shall be wired together.

3.04 VERTICAL JOINTS

- A. Construction and control joints indicated on Drawings are mandatory and shall not be omitted.
- B. Construction joints shall be continuously bevel keyed, 2 x 4 in. nominal, except as noted, and first placed surface shall be treated as specified under "Placing Concrete" in this Section.
- C. Joints not indicated or specified shall be placed to least impair strength of structure and shall be subjected to review of the SER.

3.05 INSTALLATION OF EMBEDDED ITEMS

- A. Conform to requirements of ACI 318, Chapter 6, paragraph 6.3, "Conduits and Pipes Embedded in Concrete", and as specified below.
- B. Installation of inserts required by other trades, shall be coordinated with, or shall be installed prior to, placing of reinforcing steel. All inserts shall be supplied by respective trades and installed by the General Contractor.

3.06 INSTALLATION OF UNDER-SLAB VAPOR RETARDERS OR BARRIERS

- A. Examine surfaces to receive membrane. Notify architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.
- B. Install vapor retarder or barrier in conformance with manufacturer's printed instructions.
 1. Overlap edges of sheets 6 in. and tape joints using manufacturer's sealing tape.
 2. Seal all penetrations by piping, conduits, rebar or other penetrant items with manufacturer's mastic and/or sealing tape.
 3. Seal vapor barrier sheet to surrounding vertical surfaces as shown on Drawings.
 4. Protect installed vapor retarder from damage and perforation following installation. Sequence installation so that sheet will not be exposed to traffic without protection for extended periods of time.
 - a. Prior to concealing vapor barrier, notify the Architect to arrange for evaluation of the in-place material for damage including perforations.
 - b. Repair all damaged areas per the manufacturer's recommendations, or replace products if repair is not acceptable, as determined by the Architect.

3.07 SLAB ON GRADE JOINTS

- A. Control joints in the slab on grade shall be made by either of the following methods:

1. Saw Cutting: Saw cutting shall be accomplished using a "Soff-Cutt" saw or approved equal.
 - a. Saw cutting shall begin immediately after final finishing.
 - b. Where saw cut joints may read through floor finishes, fill joint with grout prior to installing proposed finish.
 - c. When slab curl occurs at saw-cut joints that will be visible through floor finishes or is unacceptable to the manufacturer or installer of applied finishes, grind, fill or repair slabs per corrective work requirements of this section.
2. Preformed Joints: Install as per the manufacturers instruction material to form the control joint at all slabs on grade.

3.08 MIXING, CONSISTENCY, AND DELIVERY OF CONCRETE

A. Concrete shall be ready-mixed and produced by a plant acceptable to the SER and the Testing Agency. Hand or site mixing shall not be done. Constituents, including mixture, shall be batched at the central batch plant. Admixtures shall be premixed in a solution form and dispensed as recommended by the manufacturer.

B. Concrete shall arrive at the job site at a slump of 2 – 3 in., and at the time of deposit shall be as follows: Portion of Structure Slump Recommended Max. Range

Pavements, Slabs on Grade and Metal Decks	3 inch	2 - 4 inch
Footings, Grade Beams, Pile Caps		
Site Concrete and Site Retaining Walls	4 inch	3 - 5 inch
Reinforced Walls	4 inch	3 - 5 inch

1. If a high range water reducing admixture (superplasticizer) is used, it may be added at the job site after verifying that the delivery slump is 2 to 3 in. The maximum slump, after adding the HRWR admixture, shall be 8 in.
 2. For normal weight concrete, water may be added to the concrete at the site only to make up water withheld at the plant. Batching plant shall document on the driver's delivery ticket any water withheld at the plant. When water has not been withheld and slump is too low for proper handling of concrete, use the HRWR admixture to bring slump within specified range.
- C. Ready-mix concrete shall be transported to site in watertight agitator or mixer trucks loaded not in excess of rated capacities.
1. Discharge at site shall be within one and one-half hours after cement was first introduced into mix.
 2. When air temperature is between 85 to 90 deg F, discharge at site shall be within 75 minutes and when air temperature is above 90 deg F, discharge site shall be within 60 minutes.
 3. Concrete with a temperature greater than 90 deg F shall not be placed.
 4. Central mixed concrete shall be plant mixed a minimum of five minutes.
- D. Re-tempering of concrete that has partially hardened, that is, mixing with or without additional cement, aggregates, or water, will not be permitted.

3.09 PLACING CONCRETE

- A. Remove water and foreign matter from forms and excavations. Except in freezing weather or as otherwise directed, thoroughly wet wood forms just prior to placing concrete. Place no concrete on frozen soil, ice or standing water, and provide adequate protection against frost action during freezing weather.
- B. Soil bottom for slabs and footings, reinforcing, inserts, and forms shall be reviewed by Architect or his designate and/or the SER before placing concrete.
- C. To secure full bond at construction joints, surfaces of concrete already placed, including vertical and inclined surfaces, shall be thoroughly cleaned of foreign materials and laitance, roughened with suitable tools such as chipping hammers or wire brushed, and re-cleaned by stream of water or

compressed air.

1. Well before new concrete is deposited, joints shall be saturated with water.
 2. After free or glistening water disappears, joints shall be given thorough coating of neat cement slurry mixed to consistency of very heavy paste.
 3. Surface shall receive coating of at least 1/8 in. thick; this shall be scrubbed in by means of stiff bristly brushes.
 4. New concrete shall be deposited before neat cement dries.
- D. Do not place concrete having a slump outside of allowable slump range.
- E. Transport concrete from mixer to place of final deposit as rapidly as practical by methods which prevent separation of ingredients and displacement of reinforcement and which void re-handling. Deposit no partially hardened concrete. When concrete is conveyed by chutes, equipment shall be of such size and U-shaped design as to insure continuous flow in chute. Flat (coat) chutes shall not be employed.
- F. During and immediately after depositing, concrete shall be thoroughly consolidated by means of internal type mechanical vibrators.
- G. Vertical lifts shall not exceed 18 in. Vibrate through successive lifts to avoid pour lines. Vibrate first lift thoroughly until top of lift glistens to avoid stone packets, honeycomb, and segregation.
- H. Concrete shall be deposited continuously and in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within section.
- a. Notify Architect and/or the SER of each such case.
- I. Cold Weather Placement – comply with ACI 306.1 and as follows:
1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing conditions or low temperatures.
 2. Follow ACI cold weather placement procedures when concrete is placed at or below an ambient air temperature of 40 deg F; or, whenever, in the opinion of the National Weather Service five-day weather forecast, the temperatures are likely to be below 40 deg F within 24 hours after placement of concrete. Maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 3. Do not use frozen materials or materials containing ice or snow.
 4. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 5. Do not use calcium chloride, salt or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- J. Hot Weather Placement – Comply with ACI 305 and as follows:
1. Maintain concrete temperature below 90 degrees Fahrenheit at time of placement. Chilling mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is the General Contractor's option.
 2. Fog-spray forms, steel reinforcement and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots or dry areas.
- K. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of the construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or derbies to form a uniform and open-textured surface plane, before excess bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

6. During placement of concrete on slabs-on-deck, do not pile concrete. Place concrete uniformly to prevent excessive deflection of the deck and the beams.

3.10 FINISHING OF UNFORMED CONCRETE SURFACES

- A. Required concrete finishes shall conform to ACI 301 and ACI 302 as follows:
 1. Concrete slabs-on-grade shall be finished with floor flatness and levelness tolerances in accordance with ACI 302-8.15 with an Ff=30 minimum and FI=25 minimum.
 2. Concrete slab-on-deck shall be finished with floor flatness tolerances in accordance with ACI 302-8.15 with an Ff=30 minimum.
 3. When another finish is to be added or applied to a concrete slab, refer to the manufacturer and sub-contractor for required floor flatness, levelness, and/or tolerance. If these requirements are different from those specified, the more stringent requirements shall apply.
- B. Scratched Finish: Shall be provided on concrete slabs, which required bond for subsequent topping, or second slab cast over the first. Location: (see Drawings) Method: per ACI 301-5.3.4.2a (steel rakes).
- C. Steel Trowelled Finish: Location: All interior slabs, tops of equipment pads. Method: Per ACI 301-5.3.4.2c.
- D. Floated Finish: Location: All depressed slabs receiving another finish. Method: Per ACI 301-5.3.4.2b.

3.11 CURING AND PROTECTION

- A. When concrete is placed at or below an ambient air temperature of 40 degrees F, or, whenever, in the opinion of the National Weather Service five-day weather forecast, the temperatures are likely to be below 40 degrees F within 24 hours after placement of concrete, cold weather concreting procedures, according to ACI 306 and as specified herein, shall be followed.
 1. To this end, the entire area affected shall be protected by adequate housing or covering and heating.
 2. No salt, chemicals, or other foreign materials shall be used in mix to lower freezing point of concrete.
- B. Protect concrete work against injury from heat, cold, and defacement of any nature during construction operations.
- C. Concrete shall be treated immediately after concreting or cement finishing is completed, to provide continuous moist curing above 50 deg F for at least six days, regardless of ambient air temperatures, unless noted otherwise.
- D. Keep permanent temperature record, showing date and outside temperature for concreting operations.
 1. Thermometer readings shall be taken at start of work in morning, at noon, and again late in afternoon. Locations of concrete placed during such period shall likewise be recorded, in such manner as to show any affect temperatures may have had on construction.
 - a. Copies of record shall be distributed daily to the SER and the Testing Agency.
- E. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
 3. In order to avoid plastic or drying shrinkage cracks during warm, dry or windy weather, ACI 302 and ACI 309 shall be followed using wind breaks and sun shades when recommended. Evaporation retardant shall be as specified in Part 2 above.
- F. Curing Methods – Provide moisture cover curing as follows:
 1. Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.12 REMOVING FORMWORK

- A. The General Contractor shall be responsible for proper removal of formwork.

- B. Forms shall be removed only after concrete has attained 40 percent of the specified 28 day design strength. Construction loads and lateral loads should be placed without damage to the structure or cause any excessive deflection.

3.13 **FIELD QUALITY CONTROL**

- A. Field Tests and Inspections per Section 01 40 00, and as follows:
 - 1. A Program of Inspection and Testing of cast-in-place concrete work will be established by the Structural Engineer of Record (SER) who will direct the implementation of tests as carried out by an independent Testing Agency, under a separate contract with the Owner.
 - a. Materials and workmanship shall be subjected to inspection and testing in mill, shop, and/or field by the SER and/or the Testing Agency.
 - b. Such inspection and testing shall not relieve the General Contractor of his responsibility to provide his own inspection, testing and quality control as necessary to furnish materials and workmanship in accordance with requirements of Contract Documents.
 - 2. General Contractor shall notify the SER and the Testing Agency prior to start of any phase of concrete work so as to afford them reasonable opportunity to inspect work. Such notification shall be made at least 24 hours in advance.
 - 3. Compression tests shall consist of one set of five cylinders for each test made, cured, and tested by the Testing Agency during progress of job as a minimum. One cylinder will be tested at seven days and three cylinders will be tested at 28 days. One cylinder shall be retained to be tested at 56 days if the 28 day results are not acceptable and this cylinder may be discarded if not tested. One set of cylinders shall be taken for every 50-cubic yards of concrete or fraction thereof and furthermore shall be taken from batch with highest slump.
 - 4. Material and/or workmanship that is rejected by the SER and/or the Testing Agency either at the plant or at the job site shall be replaced promptly by the General Contractor to the satisfaction of the SER at no expense to the Owner.
- B. General Contractor shall hire a testing agency to prepare and test concrete cylinders, as required, for their use and certification of foundations prior to steel erection.
- C. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items prior to inspection for Substantial Completion.
 - 1. Finish touch-up damaged surfaces.
 - 2. Replace damaged materials or items with new if repair not acceptable to Architect.
- D. Manufacturer Services per Section 01 40 00, and as follows: Manufacturer's or Fabricators' field representative(s) shall give product use recommendations, and perform site visits to inspect product installation in accordance with instructions and warranty requirements.
- E. Test and Evaluation Reports - submit to the Architect and SER:
 - a. Batching and mixing procedure report.
 - b. Copies of concrete placement temperature records.

3.14 **CORRECTIVE WORK AND CRACK SEALING**

- A. Provide crack sealing for exposed concrete surfaces that develop cracks beginning at placement and through the one year correction period beginning on the date of Final Completion.
 - 1. Seal material shall be non-staining and resilient, matching the concrete color.
 - 2. Corrective work on defects and crack seal shall be performed subject to review of the Architect and/or the SER.
 - 3. Corrective work and crack sealing shall include all required labor, materials, and equipment.

3.15 **CLEANING AND PROTECTION**

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
- B. Concrete surfaces shall be cleaned of all form release agent stains in one complete operation in

the manner indicated by the manufacturer and reviewed by the Architect and/or SER.

1. Caution to be exercised to avoid staining from work overhead.
 2. Concrete cleaning shall commence when concrete is at least 28 days old, unless otherwise directed by Architect and/or SER.
- C. Protect concrete slab surfaces scheduled to be exposed in finished spaces, including slabs indicated to be polished immediately after curing.
1. Do not permit the following activities to take above concrete surfaces to be polished:
 2. ANY type of storage within 28 days of concrete placement.
 3. Vehicle parking
 4. Pipe cutting operations
 5. Ferrous metals storage
- D. Protect installed work from construction operations until date of Final Completion or Owner occupancy, whichever occurs first.

END OF SECTION

SECTION 04 00 01

MASONRY FILED SUB-BID SUMMARY

PART 1 GENERAL

FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this section shall include all unit masonry construction for the Project, including all required reinforcing and all accessories identified within the specification sections referenced below, and necessary to provide a complete installation.
- B. The Work of this Filed Sub-Bid Section may be (but is not necessarily always) indicated in the drawings with the abbreviation of "SC-MASN".
- C. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - 1. Section 04 20 00: UNIT MASONRY.

- D. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above
listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- E. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Waste Removal/Dumpster: This subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- G. Temporary Weather Protection: The General Contractor shall provide tenting and heat to the work area, including to scaffolding provided by this section, during the months of November through March. This subcontractor shall remain responsible, without exception, for providing heat to masonry materials including unit masonry, sand, water, and other components to assure proper temperatures are maintained prior to installation
- H. Cutting and Patching: This Filed Sub-Bid Subcontractor shall be perform all cutting, coring, and/or patching required to complete the work of this section, except as specifically indicated in respective sections listed as part of the work of this Filed Sub-Bid. Where any of these sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching necessary for the work of this section shall be borne by this Subcontractor. All cutting, coring, and patching shall be coordinated through and by the General Contractor. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- I. The Work of this Filed Sub-Bid Section shall include part of the scope of each of the following Sections:
1. Section 05 12 00: STRUCTURAL STEEL FRAMING: For embed plates, anchor bolts, or other items to be furnished by Division 5 and installed in the masonry work by this Contractor.
 - a. Work of this description includes the Elevator hoisting / safety beam, which will be furnished by the Section 05 12 00 subcontractor to this section for installation in the masonry work.
 2. Section 05 50 00: METAL FABRICATIONS: For loose lintels and anchors furnished by Division 5 and installed by this Contractor.
- J. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements of the following Sections:
1. Section 03 30 00: CAST-IN-PLACE CONCRETE.
 2. Section 07 84 00: FIRESTOPPING.
 3. Section 07 90 05: JOINT SEALERS
 4. Section 14 20 10: PASSENGER ELEVATORS.
 5. Division 22: PLUMBING.
 6. Division 26: ELECTRICAL.
- K. Primary Drawings listed are those intended to indicate the Scope of Work for this trade.
1. List of Primary Drawings: T-1.1, A-1.1, A-1.2, A-1.3, A-1.7, A-3.4, A-3.7, A-3.9, A-3.8, S-0.1, S-0.2, S-0.3, S-1.1, S-1.2, S-1.3, S-3.2, S-3.4, S-4.4, S-4.5, S-5.1.
- L. In addition to the above listed "Primary Drawings" that define the scope of this section, this

subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 22 00 - Unit Prices: Descriptions of unit price items, administrative requirements.
- D. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- E. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- F. Section 01 50 00 - Temporary Facilities and Controls.
- G. Section 01 57 21 - Indoor Air Quality Controls:
- H. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 REFERENCE STANDARDS

- A. Refer to individual specification Sections listed above for Reference Standards.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to each individual Specification Section listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 QUALITY ASSURANCE

- A. Refer to each individual Specification Section listed above for additional requirements.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Refer to each individual specification section listed above for specific warranties required.
 - (1) PART 2 PRODUCTS (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR PRODUCT REQUIREMENTS)
 - (2) PART 3 EXECUTION (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR EXECUTION REQUIREMENTS)

3.01 CLEANING

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

SECTION 04 20 00

UNIT MASONRY

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this Section shall be included in the Masonry Filed Sub-Bid. Refer to Section 04 00 01: Masonry Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Furnish all labor, materials and installation of masonry systems as shown on the drawings and/or as specified herein:
 - 1. Concrete Unit Veneer Masonry (CUVM).
 - 2. Mortar and Grout.
 - 3. Reinforcement and Anchorage.
 - 4. Accessories specified or otherwise required for a complete installation.
- B. Products installed by this Section but furnished from Other Sections:
 - 1. Section 05 12 00 - Structural Steel: Anchor bolts and bearing plates for embedding into the masonry work as it progresses, including but not limited to the following:
 - 2. Section 05 50 00 - Elevator hoistway safety beam.
 - 3. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

1.03 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 03 30 00: Cast-In-Place Concrete: Bearing surfaces for masonry units and reinforcing extending into masonry at bearing.
 - 2. Section 05 50 00 - Metal Fabrications: Loose steel lintels; metal frame members for incorporation into CMU at detention cells.
 - 3. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.
 - 4. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
 - 5. Section 07 90 05 - Joint Sealers: Backing rod and sealant at control and expansion joints.
 - 6. Section 14 20 10: Passenger Elevators: Rails and fastenings for elevators, including live loads imposed on masonry partitions

1.04 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ACI. American Concrete Institute; www.concrete.org.
 - a. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International.

2. ASTM. ASTM International; www.astm.org.
 - a. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - b. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - c. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
 - d. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - e. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - f. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - g. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - h. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
 - i. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
 - j. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
 - k. ASTM C476 - Standard Specification for Grout for Masonry.
 - l. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
3. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..
4. International Masons Institute All Weather Council.

1.05 **ADMINISTRATIVE REQUIREMENTS**

- A. Refer to Section 01 31 00 - Administrative Requirements, and the following:
 1. Coordination per Section 01 31 14 - Coordination, and as follows:
 - a. Coordinate with installation of other components that comprise the exterior enclosure.
 2. Preinstallation Meeting required per Section 01 70 00 and the following:
 - a. Preinstallation Meeting: Attend a preinstallation meeting not less than one week before starting work of this section. The General Contractor shall arrange and require attendance by all relevant installers.
 3. Sequencing and Scheduling per Section 01 32 16 - Construction Progress Schedule.

1.06 **SUBMITTALS**

- A. Construction Submittals
 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 2. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories indicating performance to project requirements.
 3. Stamped Engineering Calculation: Provide stamped engineering calculation for masonry ties spanning cavities greater than 4 1/2". Engineer shall be licensed in the state in which the project is located.
 4. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
 5. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.
 6. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.
 7. Certified Laboratory Test Reports: Submit to Architect certified copies of the reports of all tests listed below; the testing shall have been performed by an approved independent laboratory within

six months of submittal of reports for approval. Test reports on a previously tested material shall be accompanied by notarized certificates from the manufacturer certifying that the previously tested materials is of the same type, quality, manufacturer and make as that proposed for this project.

- a. Fire Rated Concrete Masonry Units - Equivalent thickness and aggregate type.
 - 1) Indicate planned method of meeting fire resistance ratings indicated. Include description of materials to be used, aggregate types, cellular fill materials, or rated block certifications.

- b. Cement Mortar: Certified mill test reports of each lot.

8. Shop Drawings: Submit to Architect detailed Shop Drawings including plans, elevations, and ends of walls; control and expansion joints; and wall openings. Shop Drawings shall also show details of positioning devices used to hold the vertical reinforcing bars in the proper position within the cells.
9. Curing and Protection: Submit to Architect detailed methods proposed for curing and protection of concrete masonry construction during normal, hot and cold weather conditions.
10. Special Procedure Submittals: Submit cold weather and hot weather protection plan per International Masons Institute All Weather Council.

B. Closeout Submittals

1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements and Section 01 78 00 - Closeout Submittals.
 - a. Operation and Maintenance Data: Indicate surface cleaning instructions.
 - b. Maintenance Materials: Furnish the following for Owner's use in maintenance of Project. Deliver to the Owner at location to be designated by the Owner; obtain signature of Owner's Authorized Representative and submit copy of receipt.
 - 1) See Section 01 60 00 - Product Requirements, for additional provisions.

1.07 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530 / ASCE 5 / TMS 402 and ACI 530.1 / ASCE 6 / TMS 602, except where exceeded by requirements of the contract documents.
 1. Maintain one(1) copy of each document on project site.
- B. Fire Rated Assemblies: Conform to MSBC (780CMR) for fire resistive requirements for fire rated masonry construction.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, Section 01 60 00, and as follows:
 1. All materials shall be delivered, stored, and handled in a manner that they will be fully protected from wetting, staining, chipping, and other damage. Avoid staining, and other discoloration, by the use of suitable materials for storing, moving, or handling.
 2. Store masonry materials on raised timber or platforms, at least 4 inches above ground, under ventilated, weather-tight covers or indoors. Concrete masonry units shall be kept dry at all times. If wetted, allow to dry sufficiently so that no free moisture appears on the surface of the units when used.
 3. Deliver and store cement, lime, and other perishable materials in their original containers, plainly marked with brand name and manufacturer's name, indoors or in weather-tight sheds with elevated floors.
 4. Protect metal accessories and reinforcement from the elements. Immediately before placing remove all loose rust, dirt, and other foreign materials.
 5. All materials and packaging showing water marks or other evidence of damage or

contamination will be rejected and shall be promptly removed from the site.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. No frozen work shall be built upon. Before erecting masonry during temperatures below 40 deg F, a written statement shall be submitted and approval received for the methods proposed to heat the masonry materials and protect the masonry from freezing.
- B. Air temperature on both sides of the masonry shall be maintained above 40 deg F for at least 72 hours after installation. The General Contractor shall provide temporary heat to enclosed work areas. Notify the General Contractor immediately if environmental conditions in heated enclosed work areas are not maintained above 40 degrees. The Masonry Subcontractor shall provide heating for warming of masonry materials.
- C. When outside air temperature is below 40 deg F, heat sand and water before preparing mix. Do not scorch sand, do not use water warmer than 160 deg F. Maintain mortar temperature between 40 and 120 deg F.
- D. Protect masonry from inclement weather with tarpaulins or fiber-reinforced paper held securely in place.
 - 1. Cover masonry work over nights, weekends, and holidays, and when raining.
 - 2. Cover tops of masonry partitions at the end of each day with polyethylene sheeting, to drape down each side of the wall a minimum of four feet.
 - 3. Turn scaffolding plank at night and when raining to prevent spattering of walls.

1.11 TESTING

- A. Field inspection and testing of work performed under this Section shall be in accordance with the testing requirements of the Massachusetts State Building Code, Chapter 17 – Special Inspections and the Program of Testing and Inspections developed by the SER. The Owner’s testing agency shall be present during construction of the work. The General Contractor and Filed Sub-bidder shall provide proper notification for inspections and testing, coordinate the site visits, and provide safe access to view the work performed under this Section.
 - 1. Cost of initial tests required shall be paid for by the Owner.
 - 2. All costs for retesting of failed materials shall be back-charged to the contractor and/or subcontractor , at the Owner's discretion.

(1) PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
 - 2. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
 - 3. Load-Bearing and non-loadbearing Units: ASTM C90, normal weight, or lightweight, two cell units. F'm = 1200 psi.
 - a. Hollow block, as indicated.
 - 4. Compressive Strengths: All units shall have a minimum compressive strength on the net area of 3000 PSI when tested in accordance with ASTM C•140.
 - 5. The linear drying shrinkage of concrete masonry units shall not exceed 0.065 percent when tested in accordance with ASTM C426.
 - 6. Where a fire-resistance rating is shown on the Drawings, provide UL rated products or units meeting that requirement when rated in accordance with the Equivalent Thickness Method of the ICC, or fill voids of hollow units with aggregate materials to meet the Equivalent Thickness method. Submit planned approach to providing fire ratings indicating acceptance of the local AHJ.

Table 1
MINIMUM EQUIVALENT THICKNESS IN INCHES

Aggregate Type			Fire Rating - 2 hours
Pumice			3.0
Expanded Slab			3.3
Expanded Clay, Shale, or Slate			3.95
Limestone, Scoria, Cinders, or Unexpanded Slab			4.0
Calcareous Gravel			4.2
Siliceous Gravel			4.5

NOTE: Minimum equivalent thickness shall equal net volume as determined in conformance with ASTM C140 divided by the product of the actual length and height of the face shell of the unit in inches. Where walls are to receive plaster or be faced with brick, the thickness of plaster or brick will be included in determining the equivalent.

2.02 MORTAR AND GROUT MATERIALS

- A. Proportions: Grout shall conform to ASTM C-476 and shall attain a compressive strength at 14 days of not less than 3,000 psi when tested in accordance with ASTM C91 for fine aggregate and ASTM C39 for grout containing coarse aggregate. Grout shall be used subject to the limitations of Table II.
1. Fine Grout: Fine grout shall consist of Portland Cement, lime paste or hydrated lime, and fine aggregate mixed with sufficient water to obtain a pouring consistency without segregation of the constituents. Slump shall be between nine and 11 inches.
 2. Low-Lift Grout: Low -lift grout shall consist of Portland Cement, lime paste or hydrated lime, fine aggregate and coarse aggregate mixed with sufficient water to obtain a pouring consistency without segregation of constituents. Slump shall be between nine and 11 inches. Maximum size of coarse aggregate for grout shall be in accordance with Table II.
 3. High-Lift Grout: High-lift grout shall consist of Portland Cement, grout admixture, fine aggregate, and pea gravel or coarse aggregate mixed with sufficient water to obtain a consistency suitable for pumping without segregation of the constituents. Slump shall be between nine and 11 inches. The maximum size of coarse aggregate shall be in accordance with Table II.

TABLE II
POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

Minimum Horizontal Dimensions of Core	Minimum Width of Collar Joint	Grout Type	Coarse Aggregate	Maximum Height of Grout Pour (inches)
2 x 3	3/4	Fine or Mortar	None	8
--	2	Fine or Mortar	ASTM-C404 Size 8	8
2 x 4	--	Fine or Mortar	None	16
2-1/2 x 4	--	Fine or Low Lift	ASTM C404, Size 8	48
3 x 4	--	High Lift	3/8 inch pea gravel	72 (1)
3-1/2 x 4	3-1/2	High Lift	3/8 inch pea gravel	180 (1)

5 x 6	--	High Lift	ASTM C33, 3/4 inch	180 (1)
--	5	Brick Floated in Grout	3/8 inch pea gravel	8

- B. Mixing: Batching and mixing of high-lift grout, including equipment used therein, shall conform to the applicable requirements of ASTM C94.
- C. Admixtures: The high-lift grout admixture shall conform to CRD-C619 and in addition shall produce an expansive action in the plastic grout sufficient to offset initial water loss shrinkage and promote bonding of the grout to all interior faces of the masonry units. Other admixtures may be used in mortar or grout provided that the admixture does not affect bond or compressive strength of mortar or grout designed without the use of the admixture.
Anti-freeze compounds shall not be used. The admixtures shall not contain calcium chloride salts or any other chemical that will adversely affect metals or the coatings of metals embedded in the mortar or grout.
- D. Water: Clean and potable, free from deleterious quantities of acids, alkalis, oils, salts and organic materials.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers of Joint Reinforcement and Anchors:
 1. Fero Corporation: www.Ferocorp.com.
 2. Dur-O-Wal: www.dur-o-wal.com.
 3. Hohmann & Barnard, Inc (including Dur-O-Wal brand): www.h-b.com.
 4. WIRE-BOND: www.wirebond.com.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), deformed billet bars; galvanized.
- C. Single Wythe Joint Reinforcement: Truss or ladder type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
 1. Masonry ties for anchoring unit masonry walls and partitions to intersecting masonry (other than where "tee" reinforcements are specified) and to anchor ends of concrete masonry units where adjoining concrete masonry units of different thickness, shall be 1/4 inch to 1/2 inch mesh size, 16/16 gauge galvanized steel mesh, cut to size not less than 12 inches in length and of width 2 inches less than partition width, or other steel tie system acceptable by local codes and approved by Architect.
 2. Concrete Masonry Back-Up Wall Construction: Single piece 16 gauge Type 304 stainless steel plate intended for insertion into CMU back-up wall coursing, with plastic friction fit plates for securing insulation. Plate shall be slotted to allow for vertical adjustment of wire tie locations.
 - a. Manufacturer / Product: Subject to requirements provide one of the following:
 - 1) Fero Corporation; Slotted Block Tie Type II.
 - 2) Blok Lok - A Hohman and Barnard Company: Product #BL-507.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
 3. Wire ties: Adjustable eye-and-pintel wire loop shape, hot-dip galvanized steel, 0.1875 inch thick. Provide eye and pintel dimensions as needed to fit cavity conditions and locate eye and hook portion within the cavity beyond the thickness of foamed-in-place insulation.

- a. Vertical adjustment: Not less than 2 inches.
- 4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
- 5. Concrete Back-Up Fastener: Provide powder driven anchoring fasteners at concrete structural back-up.
- 6. Insulation Washer: Provide plastic washers to hold insulation in place.
- 7. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.04 FLASHINGS

- A. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gage (0.45 mm) thick; finish 2B to 2D. Shop fabricated or factory formed to profiles and sizes indicated.
 - 1. Include integral hemmed drip edge at face of masonry veneer, including shapes to fit lipped brick conditions indicated.
 - 2. Provide shop or factory formed interior and exterior corner shapes, end dams, and other transition shapes to fit project conditions. All such shapes shall feature continuously welded or soldered water-tight joints. Adhesive and sealant joints and site-formed lapped corners are not permitted.
 - 3. Flashing Termination Bar: Plastic or stainless steel construction, profiled to accept sealing mastic along top edge.
- B. Flashing Sealant/Adhesives: Type compatible with type of flashing and Vapor Retarder / Air Infiltration Barrier product.

2.05 ACCESSORIES

- A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; 3 inch wide x by maximum lengths available.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc (including Dur -O-Wal brand); Product NS- Closed Cell Neoprene Sponge: www.h-b.com.
 - b. WIRE-BOND: www.wirebond.com. # 3000.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 - 1. Mortar Diverter: Semi-rigid high-density polyethylene (HDPE) strands woven into a 90% open mesh designed for installation at flashing locations.
 - a. Manufacturers:
 - 1) Mortar Net Solutions; Product Mortar Net: www.mortarnet.com.
 - 2) Hohman & Barnard; Product Mortar Trap.
 - 3) Keene Building Products; Product Keenestone Cut Masonry Drainage Device.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
- C. Bond Break Fabric: ASTM D226/D226M Building Paper, Type I ("No.15") asphalt felt.
- D. Type: Polyester mesh.
 - 1. Manufacturers:
 - a. CavClear/Archovations, Inc: www.cavclear.com.
 - b. Mortar Net USA, Ltd; Product Mortar Net/ Weep Vents: www.mortarnet.com.
 - c. Keene Building Products; Product Driwall Weep Vent #025; www.keenebuilding.com
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Color: As selected by Architect from full range of available colors.
- E. Type: Polyester mesh.
 1. Description: Same material as Weeps.
- F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials and meeting VOC / HAP requirements.

2.06 **LINTELS**

- A. Loose galvanized steel lintels furnished by Section 05 50 00 - Metal Fabrications for installation by this subcontractor.

2.07 **MORTAR AND GROUT MIXES**

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 1. Masonry below grade and in contact with earth: Type S.
 2. Interior, loadbearing masonry: Type S.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches. 2500 psi minimum strength.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 **EXAMINATION**

- A. Inspect surfaces and conditions in areas which masonry work is to be installed. Notify Contractor in writing of conditions which may have a detrimental effect on the timely execution, quality or performance of work of this section.
 1. Verify that field conditions are acceptable and are ready to receive masonry.
 2. Verify that related items provided under other sections are properly sized and located.
 3. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- B. Report to Contractor in writing each condition in other work or in environment that will adversely affect the execution, permanence or quality of the work of this Section. Starting of work shall constitute acceptance of all conditions.
- C. Pre-Construction Coordination Conference: Masonry Contractor shall coordinate with Vapor Retarder / Air Infiltration Barrier (VR/AIB) subcontractor to review installation requirements. The General Contractor shall arrange for the VR/AIB manufacturer's representative or technical rep to attend this meeting and to ensure proper coordination between trades.

3.02 **PREPARATION**

- A. Layout new masonry work in advance to ensure accurate spacing of surface bond patterns, uniformity of joint widths and to properly locate all openings. Avoid the use of less than half size units at corners, jambs and wherever possible at other locations.
- B. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 **COLD AND HOT WEATHER REQUIREMENTS**

- A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent and with Cold Weather Masonry Plan Submittal.
- B. Cold Weather Construction:

1. General:
 - a. Provide enclosed area for storage of materials and preparation of mortar.
 - b. Provide enclosed, heated work area for installation. Maintain heat at no less than 40°F on newly built wall for at least 24 hours. Use insulated blankets when wind chill is zero or less.
 - c. Avoid rapid drying out by overheating enclosure.
 - d. Do not lay masonry on ice or frozen surfaces.
2. Mortar and Grout
 - a. Do not use frozen sand. Heat sand when air temperature is below 32°F.
 - b. Use heated mix water (70° to 160°F) when air temperature is below 40°F.
 - c. Heat masonry units when air temperature is below 20°F. Unit shall not be less than 25°F when laid.
- C. Hot Weather Construction:
 1. Lightly wet mortar bedding surface.
 2. Keep mortar moist. Do not string out on wall so far ahead of units so that drying occurs before placing units.
- D. Lightly fog spray completed areas to prevent rapid drying. Use windbreaks to shield area from drying wind.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 1. Bond: Running.
 2. Coursing: One unit and one mortar joint to equal 8 inches.
 3. Mortar Joints: Concave at interior exposed joints, flush at surfaces scheduled to receive sheet or fluid-applied waterproofing or vapor retarder / air infiltration barrier (VR/AIB); unless noted otherwise on the drawings.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Isolate masonry partitions from vertical structural framing members with a sealant control joint as indicated.
- I. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
- J. Provide bond break fabric between precast and CUVM units. Provide single-wythe horizontal joint reinforcement on "brick side" of bond break fabric.

3.06 MORTAR

- A. Grout masonry cores and hollow metal (HM) frames solid as indicated by the Drawings, and per ASTM C476.
- B. Grout solid all hollow masonry to receive anchors or reinforcement.

3.07 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate installation of foamed-in-place insulation (by Building Insulation Trade Contractor) and accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.10 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Refer to Structural Drawings.
- B. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- C. Provide additional horizontal joint reinforcement in joints requiring bond break fabric.
- D. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- E. Vertical Reinforcement:
 - 1. Splice reinforcement bars where shown and provide lapped splices. In splicing vertical bars or attaching to dowels, lap ends and place bars in contact with tie wire. Provide minimum lap shown, or 48 bar diameters.
 - 2. Place one bar per cell at spacing as noted on structural drawings, plus at corners and each side of openings as minimum reinforcement unless noted otherwise.

3.11 GROUTING

- A. Use low lift grouting procedures only.
- B. Provide cleanout holes in first course at all vertical cells which are to be filled with grout.
- C. Prior to grouting inspect and clean grout spaces. Remove dust, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. After final cleaning and inspection, close cleanout holes and brace closure to resist grout pressure.
- D. Grout shall be placed in masonry at a minimum temperature of 70 degrees F and a maximum temperature of 120 degrees F. The grouted masonry shall be maintained above 32 degrees F for a minimum of 24 hours following placement of grout.
- E. Place and tie vertical reinforcement prior to laying CMU. Extend above elevation of maximum pour height as required to allow for splicing. Support bars in position at vertical intervals not exceeding 24" with rebar spacers.
- F. Lay CMU to maximum pour height. Do not exceed 4', or less if bond beam occurs below 4' pour height.
- G. Pour grout using container with spout or by chute. Rod or vibrate grout during placement. Place grout continuously; do not interrupt pour for more than one hour. Terminate grout 1-1/2" below top course of pour.
- H. Bond beams: Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcement in bond beam. Place grout in bond beam after filling vertical cores above bond beam.

3.12 LINTELS

- A. Install loose steel lintels or precast concrete over openings in brick veneer, and loose steel or reinforced unit masonry lintels in CMU walls, per structural drawing schedules and as indicated in the drawings.

3.13 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed borrowed lite frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.

- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 TOLERANCES

- A. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- B. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

3.15 CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 FIELD QUALITY CONTROL

- A. Inspection and testing of reinforced masonry Work will be performed by an independent Testing Agency, under a separate contract with the Owner. Materials and workmanship shall be subjected to inspection and testing in shop and field by Architect and/or Testing Agency. Such inspection and testing shall not relieve Contractor of responsibility to provide additional inspection, testing, and quality control as necessary to furnish materials and workmanship in accordance with requirements of Contract Documents.
- B. Notify Architect and Testing Agency prior to start of any fabrication, erection, or other phases of work so as to afford them reasonable opportunity to visit the site. Such notification shall be made at least 36 hours in advance.
- C. Field Tests:
 - 1. Moisture Content: Sampling and testing of concrete masonry unites for moisture content will be performed by Owner. Upon delivery of units to the project site and periodically thereafter, samples shall be selected at random from stockpiles and tested in accordance with ASTM C140. If the moisture content requirements in ASTM C90 are not met, additional protection for stockpiles will be provided immediately. If the moisture content is over 5 percent maximum, the units will be rejected for use until they are made to conform to the moisture content requirements.
 - 2. Field Tests for Strength of Mortar and Grout: The strengths specified for grout and mortar will be verified during the progress of the work by testing samples taken at the job site as follows. Any changes to the mix or materials will require the testing of samples.
 - a. Mortar: Each day prepare at least three specimens of mortar placed that day. Samples will be tested in accordance with the applicable portions of ASTM C780 and shall exhibit a minimum ultimate compressive strength of 2500 psi.
 - b. Grout: Prepare at least three specimens each day of grout placed that day. Samples will be tested in accordance with the applicable portions of ASTM C39 and shall exhibit a minimum ultimate compressive strength of 3000 psi.
 - 3. Prism Tests: Make at least one prism test sample for each 5,000 square feet of wall but not less than three such samples for any building. Each sample shall consist of three prisms. Owner will perform the tests.
 - a. Prisms shall be tested in accordance with ASTM C1314.
 - b. Compressive strength should be not less than 2000 psi.
- D. The cost of additional testing and inspection required because of changes in materials or proportions requested by the Contractor shall be paid by the Contractor.

3.17 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
- B. Remove excess mortar and mortar droppings.

- C. Replace defective mortar and nonconforming masonry. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.
- E. Vacuum interior exposed masonry surfaces to keep free of granules and dust
- F. Protect precast concrete masonry and prefinished window and curtainwall assemblies during cleaning of brick veneer. Protection shall consist of polyethylene plastic sheathing secured above and draped over items requiring protection. Edges shall be taped into place. Immediately remove stains and discoloring cleaning fluid residue from precast concrete.
- G. Use non-metallic tools in cleaning operations.
- H. Cleaning methods shall be tested on the mockup panel prior to use on the building.

3.18 **PROTECTION**

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities. Remove immediately prior to Substantial Completion.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. All materials and labor required for the completion of the work of this Section including but not limited to:
 - 1. Furnishing of leveling plates, bearing plates, columns, beams, base plates, bracing, and connections (bolted angles, channels, stiffeners, separator plates, clips, supports for steel deck at columns, connections, welding filler metal, and electrodes anchor bolts, connection bolts, and erection bolts).
 - 2. Items of structural steel required to be built into concrete or masonry as indicated or specified shall be furnished to the respective trades at the proper time with complete instruction and templates to facilitate inspection.
 - 3. Unless specifically excluded, furnishing and installation of all other items for structural steel work indicated on the Drawings, specified, or required to make the work of this Section complete.
- B. Items to be furnished only:
 - 1. Furnish the following items for installation under designated Sections:
 - a. Anchor Bolts: Furnish to Section 03 30 00 and 04 20 00
 - b. Leveling Plates: Furnish to Section 03 30 00 and 04 20 00
 - c. Embedded Plates: Furnish to Section 03 30 00 and 04 20 00

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual including the Construction Manager's Scoping documents apply to this subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. General Conditions, Supplementary Conditions, Construction Manager's Scoping documents, and applicable parts of Division 01 are included as part of this Section.
- B. Work being performed by others, but related to this Section, and with which this contractor must coordinate with and/or accommodate the Work of, or which contain requirements that affect the Work of this Section include the following:
 - 1. Section 01 45 23 – STRUCTURAL TESTING AND INSPECTING SERVICES.
 - 2. Section 04 20 00 - UNIT MASONRY.
 - 3. Section 09 90 00 - PAINTING AND COATING; field finishing of shop primed steel scheduled to be exposed in the finished construction.
 - 4. Section 14 20 10 – PASSENGER ELEVATORS; requirements and coordination for hoisting safety beam.
 - 5. Section 26 00 10 – ELECTRICAL; grounding of electrical system to steel frame.

1.03 PRE-INSTALLATION CONFERENCE

- A. Installer of the Work of this Section is required to attend pre-installation conference specified under Section 04 20 00 – UNIT MASONRY.

1.04 QUALITY ASSURANCE

- A. The General Contractor shall have available one copy of each of the following literature including latest revisions, which are hereby included in and made part of these specifications:
 - 1. Commonwealth of Massachusetts State Building Code
 - 2. AISC: "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings".
 - 3. AISC: "Code of Standards Practice for Steel Bridges and Buildings".
 - 4. AISC: "Specification for Structural Joints using ASTM A325 or A490 Bolts".
 - 5. AWS: "Code for Welding in Building Construction", with Addenda.
- B. Any material or operation specified by reference to the published specifications of a manufacturer, the American Society for Testing and Materials (ASTM), the American Institute of Steel Construction (AISC), the American Welding Society (AWS), the Industrial Fasteners Institute (IFI), the Steel Structures Painting Council (SSPCV), the American National Standards Inst. (ANSI), or other published standard, shall comply with the standard listed. In case of conflict between the referenced specifications, etc., the one having the most stringent requirement shall govern. In case of conflict between the referenced specifications, etc., and the project specifications, the project specification shall govern.

1.05 SUBMITTALS

- A. Samples and shop drawings are to be submitted to the Architect for approval in accordance with Section 01 3000 – ADMINISTRATIVE REQUIREMENTS.
- B. Shop drawings, erection drawings, certifications, and schedules, properly checked and coordinated with other parts of the construction, are to be submitted to the Architect for approval.
- C. Without limiting the generality of the items mentioned below, shop drawings, etc. shall be complete and shall include all information necessary for the fabrication and erection of the component parts of the structure.
 - 1. These drawings shall show: Type of steel for each member, location and identification mark of each member, dimensions, size and weight of members, location and size of cuts, copes, slots, holes and openings required by other trades, type, size, and extent of all welds, joint welding procedures, welding sequence, and painting requirements (The welding symbols used shall be as adopted by the American Welding Society).
 - 2. These drawings shall show all requirements such as (1) temporary members required for erection including connections.
 - 3. The General Contractor shall provide a searchable pdf of the erection drawings and use of their 3-D detailing model. If Contractor is unable to provide pdf drawings, drawings shall be provided in AutoCAD dwg format.
- D. Except as otherwise noted the approval of shop drawings will be for size and arrangement of principal and auxiliary components and strength of connections. Any error in dimensions shown on the shop drawings shall be the responsibility of the General Contractor.
- E. Fabrication of any material, cutting of any holes or performance of any work shall not proceed until shop drawings have been reviewed by the Architect.
- F. Certified copies of mill test reports including names and locations of mills and shops and analysis of chemical and physical properties, of steel to be used on this project shall be submitted to the Architect before delivery to the job site.
- G. Manufacturer's certification of bolts, nuts, and filler metal for welding shall be submitted to the Architect.
- H. The General Contractor shall maintain records of test results of welding procedures and records of welders employed, date of qualification, and identification symbol or mark. Such records shall be available for examination by the SER and Testing Agency or certified copies submitted upon request to the SER and the Testing Agency.

- I. Methods of Erection: Prior to starting work the Construction Manager shall submit to the Architect a description of the methods, sequence of erection, and type of equipment he proposes to use for erecting the structural steel work. This submission or approval shall not relieve the Construction Manager of his responsibility for providing the proper methods, equipment, workmanship, or safety precautions.

1.06 TESTING & INSPECTION

A. Inspection, Testing, and Quality Control:

A program of Inspection and Testing of structural steel work will be established by the Structural Engineer of Record (SER) who will direct the implementation of tests as carried out by an independent testing agency. All costs for inspection and testing shall be borne by the Owner.

- B. The materials and workmanship to be furnished under this Section shall be subject to inspection and testing in the mill, shop, and field by the SER and/or the Testing Agency. Such inspection and testing shall not relieve the General Contractor of his responsibility to provide his own inspection and quality control and to furnish materials and workmanship in accordance with the requirements of the contract documents.
- C. The General Contractor and Testing Agency shall examine the contract documents and become thoroughly acquainted with detailed inspection and testing requirements as outlined by the SER.
- D. The General Contractor shall cooperate with and facilitate inspection and testing by the SER and/or the Testing Agency. The General Contractor shall furnish, at his own expense, the SER and/or the Testing Agency upon request, with the following:
 1. A complete set of reviewed erection drawings, detailed shop drawings, schedules, and corrective work procedures at the fabricating shop or shops in the field.
 2. Cutting list, order lists, material bills, and shipping lists.
 3. Information as to time and place of all rollings and shipment of material to shops
 4. Representative sample pieces requested for testing.
 5. Assistance for testing materials and proper facilities for inspection of the work, in the mill, shop, and field.
- E. The Testing Agency shall inspect and test, as required by the SER, all welded and bolted work.
- F. Weldments and bolted connections that are required by the SER and/or the Testing Agency to be corrected shall be corrected without delay at the General Contractor's expense and to the satisfaction of the SER and/or the Testing Agency. The SER or the Testing Agency shall require drawings showing proposed corrective work to be submitted for review.
- G. The General Contractor shall notify the SER and/or the Testing Agency five days prior to the shipment of any structural steel so that a paint inspection can be made. At these inspections, the dry mill thickness of the paint film will be checked and steel containing mill scale that can easily be removed with the blade of a pocketknife will be subject to re-cleaning and repainting at the expense of the General Contractor.
- H. Any material or workmanship which is rejected by the SER and/or the Testing Agency either in the mill, shop, or field shall be replaced promptly by the General Contractor to the satisfaction of the SER and/or the Testing Agency.
- I. The fact that steel work has been accepted at the shop shall not prevent its final rejection at the job site, even after it has been erected, if it is found to be defective in any way.

1.07 QUALIFICATIONS

- A. The General Contractor shall submit conclusive evidence to the Owner that the fabricator and the erector has satisfactorily completed projects of similar scope and have adequate fabrication facilities to meet production requirements.

(1) PART 2 PRODUCTS

2.01 MATERIALS

- A. All steel is to consist of a minimum of 95 percent recycled steel with over 80 percent post-consumer and 15 percent pre-consumer recycled content.
- B. All wide flange shapes shall be newly rolled steel conforming to ASTM A992, Fy = 50 k.s.i. unless noted otherwise on drawings.
- C. All bars, plates, channels, and angles shall conform to ASTM A36 unless otherwise indicated on the drawings.
- D. Structural tubing shall conform to ASTM A500, Grade B with minimum yield strength Fy = 46 KSI.
- E. Structural pipe shall conform to ASTM A53, Grade B.
- F. Anchor bolts shall conform to ASTM A307 or ASTM F1554 Fy = 105 k.s.i. as noted or otherwise shown on the drawings.
- G. High strength bolts ASTM A325 or ASTM A490 with ASTM A563, Grade A Hex style nuts, and compatible washers. Bolts shall be cold forged with rolled threads. Bolts with torque control snap-off ends may be used.
- H. Hot Dip Galvanizing shall conform to the latest ASTM specification as specified in Section 2.04 below.
- I. Filler metal for welding shall conform to AISC Code, 2005 Edition, Section I.4.5.
- J. Thermal Insulation Materials:
 - 1. Thermal Insulation Material will be Fiberglass-Reinforced Laminate Composite.
 - 2. Material shall maintain structural integrity of connections. Refer to Structural Drawings for specific Load requirements.
 - 3. Ultimate Material Properties:

a. Tensile Strength	ASTM	11,000 psi (75.8 MPa)
b. Flexural Strength	D638	25,000 psi (172.4 MPa)
c. Compressive Strength	ASTM	38,900 psi (268.2 MPa)
d. Compressive Modulus	D790	
	ASTM	
	D695	
	ASTM D695	
1.) ½ in. thk (12.7mm)		291,194 psi (2,007.7 MPa)
2.) 1 in. thk (25.4mm)		519,531 psi (3,582.0 MPa)
e. Shear Strength	ASTM D732	15,000 psi (103.4 MPa)
f. Thickness		1 in (25.4mm) or as indicated
g. Oxygen Index	ASTM D2863	21.8%
h. Coefficient of Thermal Expansion	ASTM D696	2.2
i. Thermal Conductivity	ASTM C177	1.8 BTU/Hr/ft ² /in/°F (0.259 W/m*°K)
j. Coefficient of Friction		0.27

2.02 FABRICATION

- A. Applicable Standards: Except as otherwise noted on the drawings or specified, the fabrication of structural steel shall be in accordance with the AISC specifications, such as will permit proper

erection.

- B. Provision for attachment of other materials: Punch and drill steel for attachment of other materials indicated on the drawings or noted in the specifications to be attached to the steel.
- C. Connections: Weld or bolt shop connections as indicated. Bolt field connections except where welded connections are indicated.
 - 1. Provide high strength threaded fasteners for principal bolted connections except where unfinished bolts are indicated.
 - 2. Provide shear tab connections for all beam to column connections where the column width is 6 in. or less.
 - 3. For columns that are 7 in. or wider, provide a double angle connection.
- D. Welding:
 - 1. Quality control and qualification of welding procedures and operations shall be as specified under Paragraph 1.04 H and 2.03 of this section.
 - 2. Shop welding shall be done by either shielded metal-arc welding or submerged arc-welding.
 - 3. All groove welds shall have complete penetration unless otherwise noted on the drawings.
 - 4. Where structural joints are required to be welded, the details of all joints, the technique of welding employed, the appearance and quality of welds made and the methods used in correcting defective work shall conform to the applicable requirements of the specifications under "QUALITY ASSURANCE" in this Section.
 - 5. The General Contractor shall prepare joint welding procedures for all welded joints which shall be approved by the SER or the Testing Agency before any welding is done. After approval, these welding procedures shall be followed without deviation unless specific approval for change is obtained from the Architect. The SER may require re-qualification of any of these welding procedures by tests prescribed in the AWS "Standard Qualification Procedure".
- E. Oxygen cutting: Manual Oxygen cutting shall be done only with a mechanically-guided torch. Alternatively an unguided torch may be used provided the cut is not within a ½ in. of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal edges. The use of oxygen-cut holes for bolted connections will not be permitted; components prepared in this manner will be rejected.
- F. Corrective Work: Structural steel members or assemblages having fabrication errors, which exceed permissible tolerances, shall be corrected only if permitted by the SER. All corrective work shall be in accordance with AISC and AWS requirements. When requested by the SER or the Testing Agency, the General Contractor shall submit to the Architect and/or SER for approval, drawings showing details of proposed corrective work and shall receive approved drawings prior to performing the corrective work. All corrective work shall be solely at General Contractor's expense.
- G. Identification: All structural steel members shall have assigned positions and identification marks or symbols, plainly indicated thereon near one end. Marks shall agree with those given on the shop drawings and erection drawings relating to or calling for the member.

2.03 SOURCE QUALITY CONTROL

- A. The General Contractor shall maintain his own quality control and inspection of all shop and field work. Quality control and inspection of all welding work shall consist of meticulous supervision by the General Contractor's own welding inspector using non-destructive spot testing, at the rate of at least one test per 50 linear feet of weld by each welder, except that full penetration welds shall be tested 100 percent. Non-destructive testing shall be done by the radiographic-magnetic particle or ultrasonic method; whichever is most effective for the joint to be tested.

The fact that steel work has been accepted at the shop shall not prevent its final rejection at the job site, even after it has been erected, if it is found to be defective in any way.

2.04 GALVANIZING

- A. Any items so noted or specified.
- B. Galvanizing shall be hot dip galvanized after fabrication in compliance with ASTM specifications A123, A153, or A386 where applicable. All galvanized materials must be inspected for compliance with these specifications and marked with a stamp indicating the ASTM number and the weight of the zinc coating in ounces per square foot. Galvanizer shall furnish a notarized statement of compliance with all specifications.
- C. Reference Standards:
 - 1. ASTM A153 for galvanizing iron and steel hardware.
 - 2. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars, and strips one-eighth of an inch (1/8") thick and heavier.
 - 3. ASTM A386 for galvanizing assembled steel products.
 - 4. AHDGA Publication, "Inspection Manual for Hot Dip Galvanized Products"
 - 5. ASTM A563 for tapping nuts after galvanizing.
 - 6. ASTM A325 for galvanizing high strength bolts.
- D. Grade Stamps and Certifications: Each piece of galvanized metal shall be inspected and stamped with ASTM number and weight in ounces per square foot applied. Furnish Certificates of Compliance signed by General Contractor and galvanizer stating that galvanizing complies with these specifications.
- E. Packaging and Handling after Galvanizing: Suitable to prevent damage to galvanized surfaces and distortion of steel. Avoid wet stain by ensuring free circulation of air around stored material.
- F. Fabricator's Responsibilities: Furnish to Galvanizer shop drawings of non-standard fabrications to coordinate fabrication with galvanizing and to avoid problems with warpage due to improper provisions for hot-dipping.
- G. Touch-Up: Touch-up abraded surfaces adjacent to weldments section using 95 percent (by weight) organic zinc- rich paint over wire brush preparation per ASTM 780-80. DFT shall equal thickness required for galvanized coating in the reference standards.

2.05 PAINTING

- A. Applicable Standards: Except as otherwise indicated on the drawings or specified, the painting of structural steel shall be in accordance with the SSPC specifications under "Requirements of Regulatory Agencies".
- B. Steel to be painted:
 - 1. Unless specifically excluded, all structural steel shall receive one shop coat of primer paint.
 - 2. Surfaces requiring paint shall be painted only to within 2 in. of any field weld. If for any reason the surface to be field welded is painted, such paint shall be completely removed in the shop to within the stated limits before field welding.
 - 3. Surfaces, inaccessible after assembly, excluding bolted, finished, or welded surfaces at connections. Surfaces encased in exterior building insulation shall receive two coats of primer paint.
 - 4. Thoroughly clean all steel to be painted of all loose mill scale in accordance with structural steel painting council standards SP-2. Remove all rust, dirt, weld flux, weld spatter, and other foreign matter. Oil and grease deposits shall be removed.
- C. Steel to be left unpainted:
 - 1. Contact surfaces (e.g. high strength bolted connections).
 - 2. Steel indicated on the drawings to be encased in concrete.

3. Top flange of beams to receive steel shear studs.
4. Steel to receive spray fireproofing.

D. Shop Painting:

1. All ferrous metal surfaces, except pre-finished galvanized items and those obviously not to be painted, shall before leaving the shop or manufacturing plant, be cleaned of all scale, rust, grease, and other foreign matter and shall be given one thorough shop coat, on all surfaces of a metal primer, ready and compatible for finish painting at the building site under PAINTING. Primer shall be Tnemec Co. #1009 Gray Metal Primer or equal by manufacturer listed under PAINTING SECTION, and shall be compatible with materials to be used in field painting and shall be used directly from factory labeled containers. Touchup damaged and abraded spots after installation using same paint.
 - a. After steel has been properly prepared as specified above, apply primer paint to dry steel surfaces by brush, spray, or roller assuring no running or sagging in accordance with manufacturer's directions.
 - b. The coverage rate per coat shall not be more than 400 square feet per gallon resulting in a wet film thickness of 2 mils.
 - c. Inspection of shop painting shall be specified under "Inspection, Testing and Quality Control" in this Section.

2.06 **PRODUCT HANDLING**

- A. Handle, transport, and stack all materials carefully to prevent deformation or damage. Store all structural steel members carefully on substantial timbers and blocking, so arranged that the steel will not be in contact with the earth and properly drained, preventing any spattering with dirt or accumulation of water in or about the steel. Take care to prevent the accumulation of mud or other foreign matter on the steel.

PART 3 EXECUTION

3.01 **ERECTION**

- A. The General Contractor shall survey the anchor rods prior to the erection of structural steel and shall notify the design team of any misplaced anchor rods that require remedial work.
- B. Applicable Standards: Except as otherwise indicated on the drawings or specified, the erection of structural steel shall be in accordance with the AISC Specification listed under "Requirements of Regulatory Agencies".
 1. All beams shall be installed web normal. Add shims or other accessories, as required, to support pitched deck.
- C. Methods of Erection: Prior to starting work the General Contractor shall submit to the Architect a description of the methods, sequence of erection, and type of equipment he proposes to use for erecting the structural steel work. This submission or approval shall not relieve the General Contractor of his responsibility for providing the proper methods, equipment, workmanship, or safety precautions.
- D. Temporary Floors: All temporary flooring, planking, and scaffolding necessary in connection with the erection of the structural steel or the support of erection machinery shall be provided as a part of the erection work. The temporary floors shall be as required by state and municipal laws and governing safety regulations.
- E. Field Connection: Unless otherwise indicated, shall be welded or bearing-type (N) high strength bolts tightened to provide the minimum tension shown in Table J3.7 of AISC "Manual of Steel Construction". Unless otherwise indicated, beams shall have framed double angle connections using $\frac{3}{4}$ in. diameter (minimum) high strength bolts in accordance with the requirements of the AISC "Manual of Steel Construction".

3.02 **WELDING:**

- A. Field welding shall be executed in accordance with all the requirements under "Fabrication Welding" in this Section, excepting those requirements that manifestly apply to shop conditions only.
- B. All field welding shall be performed by manual shielded metal-arc welding only.
- C. Oxygen cutting in the field will not be permitted without prior approval of the SER.

3.02 GUARANTEE

- A. The General Contractor shall furnish to the Owner a written guarantee covering all defects in materials and workmanship that occur within a period of one year from the date final of completion of the building. Should any defects in materials and workmanship develop within this time, all necessary repairs and replacements shall be made at no additional cost to the Owner.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnishing and/or installation of metal fabrications shown on Drawings that are not part of structural steel or other metal systems in other Sections of the Specifications including but not limited to iron and steel shapes, plates, bars, strips, tubes, pipes, castings, loose lintels, and ladders. See below for requirements:
 - 1. Fabricate, furnish, deliver, erect and install:
 - a. Straps, anchors, plates, bolts, shims, and all other items required for building in or anchoring all items included in items above.
 - b. Other items as identified in drawings, including but not limited to steel components associated with overhead door jamb and head details.
 - 2. Fabricate, furnish, and deliver for installation by other sections:
 - a. Loose steel lintels for openings in masonry walls and partitions.
 - b. Galvanized steel pipe bollards.
 - c. Straps, anchors, plates, bolts, shims, and all other items required for building in or anchoring all items included in items above.
 - 3. Design, fabricate, furnish, deliver, erect and install:
 - a. Elevator pit ladder.
 - b. Egress Gate at Stair 2
 - c. Fixed vertical ladders at building interior and roof.
 - d. Elevator pit frames, and associated components. Refer to Section 05 53 05 Metal Gratings and Floor Plates for pit grating.
 - e. Straps, anchors, plates, bolts, shims, and all other items required for building in or anchoring all items included in items above.
 - 4. Shop painting. Field touch up shall be included.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions and applicable parts of Division 01 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
 - 2. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
 - 3. Section 05 12 00 - Structural Steel Framing
 - 4. Section 09 90 00 - Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior

Performing Organic Coatings on Aluminum Extrusions and Panels.

2. ASTM. ASTM International; www.astm.org.
 - a. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - b. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - c. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - d. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - e. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - f. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 - g. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - h. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).
 - i. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - j. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - k. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings.
 - l. ASTM B85/85M - Standard Specification for Aluminum-Alloy Die Castings.
 - m. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - n. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
 - o. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
 - p. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric).
 - q. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
 - r. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric).
 - s. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - t. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
3. AWS. American Welding Society; www.aws.org
 - a. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
 - b. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; American Welding Society.
4. SSPC. The Society for Protective Coatings; www.sspc.org/standards/scopes.html
 - a. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings.
 - b. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.

1.04 SUBMITTALS

- A. Construction Submittals:
 - 1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
 - 2. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - a. Stamped engineered drawings and calculations for items indicated to be designed (noted previously):
 - 1) Submit design drawings and engineering calculations stamped by a Structural Engineer licensed in the Commonwealth of Massachusetts, proving compliance with MSBC (780 CMR) load requirements.
 - 3. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

- A. Fabricator: A firm experienced a minimum three (3) years in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.
- C. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly, and to coordinate installation.
- D. The licensed engineer as referenced above is to make periodic visits to the site to inspect and test as necessary the stair, handrail, and other metal work assemblies. After completion of the work and based on these inspections, an affidavit stamped with the seal of the engineer is to be issued to the structural engineer of record (SER). The affidavit shall state that the work has been installed in accordance with his/her design.

1.06 MOCK-UP

- A. The project scope includes a stand-alone mock-up assembly representative of the exterior envelope of the building, and includes the Work of this section and other components of the exterior envelope as described in Section 01 40 00 - Quality Requirements.
- B. The Mock-up assembly shall be constructed, observed, and all corrective actions required by the Architect or Owner shall be completed and mock-up accepted prior to commencing work of building envelope.
- C. Schedule Submittals for products indicated to be used in the mock-up so in sufficient time to allow review prior to the scheduled erection of the mock-up. Allow time for resubmittal and review.
- D. Following acceptance of submittals for material components and selection of colors provide materials of each color selected, installed in place on the mock up for final review by Architect prior to proceeding with the Work.
 - 1. The mock-up shall be constructed full size as indicated in the Drawings, and utilize specified colors and materials.
 - 2. Demonstrate the anticipated range of materials, workmanship and finish expected.
 - 3. Accepted mock-ups will be used as standard of comparison, workmanship and pertinent details.
 - 4. Modify and/or replace mock-ups as many times as necessary to obtain Architect's and Owner's approval.
 - 5. Do not start work until mock-ups are accepted by Owner and Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 60 00 Product Requirements, for additional requirements.
- B. Comply with manufacturer's instructions and recommendations.
- C. Mark products with Shop Drawing location reference, unless already properly marked.
 - 1. Use removable tags or concealed markings.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements and submittal instructions.
- B. All materials and work of this section fabricated by a manufacturer shall be covered by the manufacturer's standard warranty but not for less than required by the conditions of the contract and general requirements.
- C. Provide manufacturer's lifetime warranty on winch equipment.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.
- C. Plates: ASTM A 283.
- D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- F. Slotted Channel Fittings: ASTM A1011/A1011M.
- G. Fasteners:
 - 1. Masonry Anchors: Expansion shield, FS FF-S-325.
 - 2. Lag Bolts: Square head type, FS FF-B-561.
 - 3. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.
 - 4. Machine Screws: Cadmium plated steel, FSFF-S-92.
 - 5. Wood Screws: Flat Head carbon steel, FSFF-W-111.
 - 6. Plain Washers: Round carbon steel, FS FF-W-92.
 - 7. Lock Washers: Helical spring type carbon steel, FS FF-4-84.
 - 8. Neoprene Washers
 - 9. Toggle Bolts: Tumble-wing type, FS FF-B-488, type, class and style as required.
 - 10. Type 304 stainless steel, injection adhesive anchors. AISI 304 or AISI 326 meeting requirements of ASTM F593 (condition CW).
 - 11. Certified rated steel screw pin shackles.
 - 12. Any fasteners used to fasten to galvalume metal shall be type 304 stainless steel and shall have a neoprene washer or other neutral material between dissimilar metals to prevent corrosion.
- H. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1.
- I. Concrete Inserts: Threaded or wedge type, galvanized ferrous castings either malleable iron ASTM A47 or cast steel ASTM A27.
- J. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- K. Training Anchors:
 - 1. Basis of Design: Actek Safety Hoist Ring (800-752-7229) - threaded hoist ring for loads indicated
 - a. Medium Duty Anchor - 1200 pounds.
 - b. Light Duty Anchor - 200 pounds.
 - 2. Refer to Drawings for location.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with

design of component, except where specifically noted otherwise.

- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. All fabricated items shall be made using acceptable materials listed above and as shown on the drawings (including structural drawings).
- B. Interior and Exterior Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; galvanized finish.
 - 1. Unless otherwise shown, provide C4x5.4 continuous structural steel channel side rails with eased edges, spaced 18" apart.
 - 2. Rungs: one inch diameter solid round bar spaced 12 inches on center (non-slip finish).
 - 3. Space rungs 7 inches from wall surface.
- C. Bollards: Steel pipe, concrete filled, welded crowned cap, as detailed; galvanized finish.
- D. Lintels: Sizes and configurations as scheduled in structural drawings; galvanized finish.

2.04 FINISHES - STEEL

- A. Prime paint all steel items.
 - 1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing. Remove scale, rust and other deleterious materials before applying shop paint. Clean off heavy rust and loose mill scale in accordance with SSPC SP 3 "Power Tool Cleaning", or SSPC SP 7 "Brush Off Blast Cleaning".
- C. Prime Painting: Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions and at a rate to provide uniform dry film thickness of 2.0 mil. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.
- D. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction and compatible with paint finishes indicated.
 - 1. Product: IronClad Retardo Rust Inhibitive Paint 163, or and Architect acceptable equivalent product subject to compliance with requirements.
- F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- G. Finishes:
 - 1. Galvanizing for Steel Shapes: ASTM A 123 / A 123M.
 - 2. Galvanizing for Steel Hardware: ASTM A 153 / A 153M.
 - 3. All ferrous metals exposed to weather and all ferrous metals to be located in Apparatus Bays, locker rooms, kitchen, mechanical rooms, and where indicated shall be hot-dip galvanized after fabrication and factory primed with a primer compatible with and recommended by the manufacturer of the galvanizing coating and process.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal

3.05 PROTECTION

- A. Protect installed work from subsequent construction operations until date of Substantial Completion or Owner Occupancy, whichever occurs first..

END OF SECTION

SECTION 05 53 05

METAL GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this Section shall be included in the Miscellaneous Metals Filed Sub-Bid. Refer to Section 05 00 01: Miscellaneous Metals Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Formed metal floor gratings and support framing system for elevated floor conditions.
- B. Flat surface floor and stair tread plating.
 - 1. Application: Elevator Pit Sump Cover.
- C. Accessories required for a complete installation, including but not limited to anchors, fasteners, shims, and non-shrink grout.
- D. Furnish frames and anchors for embedment in concrete to the concrete subcontractor for installation, and coordinate placement with that subcontractor.

1.03 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions and applicable parts of Division 01 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
 - 2. Section 05 12 00 - Structural Steel Framing.
 - 3. Section 05 50 00 - Metal Fabrications.

1.04 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM. ASTM International; www.astm.org.
 - a. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - b. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - c. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - d. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - e. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
 - f. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - g. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
 - h. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric).
 - 2. AWS. American Welding Society; www.aws.org.

- a. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society.
- b. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
- 3. NAAMM. National Association of Architectural Metal Manufacturers; www.naamm.org.
 - a. NAAMM MBG 531 - Metal Bar Grating Manual; The National Association of Architectural Metal Manufacturers (ANSI/NAAMM MBG 531).
 - b. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual; The National Association of Architectural Metal Manufacturers (ANSI/NAAMM MBG 532).
- 4. SSPC. The Society for Protective Coatings; www.sspc.org/standards/scopes.html.
 - a. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.
 - b. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings.

1.05 PERFORMANCE REQUIREMENTS

- A. Design Live (Pedestrian) Load: Uniform load of 100 lb/sq ft minimum; concentrated load of 300 lbs.
- B. Maximum Allowable Deflection Under Live Load: 1/240 of span; size components by single support design.
- C. Maximum Spacing Between Bars: To comply with applicable barrier free codes and guidelines.

1.06 SUBMITTALS

- A. Construction Submittals:
 - 1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
 - 2. Product Data: Provide span and deflection tables.
 - 3. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.
 - a. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 4. Samples: Submit three samples, 12x12 inch in size illustrating surface finish, color, and texture.
 - 5. Delegated Design Data: Submit Engineering calculations for all components demonstrating compliance with structural loading requirements of building code prepared by a Structural Engineer licensed in the state of the project.
 - a. Submit design engineer's inspection report at 50% completion of construction, accepting work or describing remedial action to be completed.
 - 6. Manufacturer's Installation Instructions: Indicate special requirements for opening and perimeter framing.
- B. Closeout Submittals:
 - 1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements and Section 01 78 00 - Closeout Submittals.
 - a. Submit design engineer's site inspection and final acceptance of completed work documentation as soon as practically possible upon completion of Metal Stair work.

1.07 QUALITY ASSURANCE

- A. Designer Qualifications: Design gratings and plates under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in Massachusetts.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal floor grating: Basis of Design Product: McNichols Company Product Series 11-W-4 or equal.
- B. SlipNOT Metal Safety Flooring: www.slipnot.com.
- C. Indiana Gratings, Inc.: www.indianagratingsinc.com.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Steel Floor Plate: ASTM A786/A786M; pattern no. 5.
- B. Steel For Welding or Riveting: ASTM A 36/A 36M, unfinished, of shapes indicated.
- C. Cross Bars: ASTM B 211 (ASTM B 211M) solid bars.
- D. Welding Materials: AWS D1.1; type required for materials being welded.
- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.03 ACCESSORIES

- A. Fasteners and Saddle Clips: Galvanized steel.

2.04 FABRICATION

- A. Fabricate grates and plates to accommodate design loads.
- B. Fabricate support framing and grating in section sizes to allow for easy removal; individual panels to be 4 ft x 4 ft maximum size.
- C. Fabricate support framing for openings.
- D. Top Surface: smooth.
- E. Bearing Bar: 3/16 x 1-1/4 inch size, spaced 11/16 inches on center.
- F. Cross bars spaced at 4 inches on center.
- G. Welded construction.

2.05 FINISHES

- A. Do not prime surfaces in direct contact with concrete or where field welding is required.
- B. Galvanizing for Steel Shapes: ASTM A123/A123M.
- C. Galvanizing for Steel Hardware: ASTM A153/A153M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated on shop drawings.
- B. Verify that opening sizes and dimensional tolerances are acceptable.
- C. Verify that supports are correctly positioned.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and drawings. Anchor frames to adjacent construction.
- B. Place support frames in correct position, plumb and level. Fasten to structure.
- C. Set frame so that top of plate or grating is flush with top of grating and surrounding construction.
- D. Secure metal floor plate to frame to prevent movement.

3.03 TOLERANCES

- A. Maximum Space Between Adjacent Sections: 1/2 inch.
- B. Maximum Variation From Top Surface Plane of Adjacent Sections: 1/8 inch.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

SECTION INCLUDES

- A. Furnish and install the following:
 - 1. Framing for Walls, roof floors
 - 2. Rough opening framing for doors, windows, and roof openings.
 - 3. Roof-mounted curbs.
 - 4. Roofing Nailers
 - a. Provide wood blocking around all roof edges and penetrations unless specifically indicated otherwise.
 - 5. Preservative treated wood materials.
 - 6. Fire retardant treated wood materials.
 - 7. Plywood panel sheathing.
 - 8. Communications and electrical room mounting boards.
 - 9. Concealed wood blocking, nailers, and supports.
 - Blocking for framing, cabinets, tack and marker boards, toilet accessories, and other appurtenances as indicated in Drawings.
 - 10. Miscellaneous wood nailers, furring, and grounds.
 - 11. Roof sheathing with factory applied water-resistive barrier.
 - 12. Accessories including, but not limited to, metal connector plates, structural connectors, and fasteners.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 06 20 00 - Finish Carpentry.
 - 2. Section 07 31 13 - Asphalt Shingles - roofing nailers and blocking.
 - 3. Section 07 72 00 - Roof Accessories: Roof-mounted curbs
 - 4. Section 10 28 00 - Washroom Accessories: Grab bars and other wall-mounted accessories
 - 5. Section 10 44 00 - Fire Protection Specialties - recessed cabinets requiring blocking.
 - 6. Division 23 - HVAC: Roof Curbs.
 - 7. Division 26 - Electrical: Equipment requiring mounting (backer) boards.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
 - 2. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; National Institute of Standards and Technology, U.S. Department of Commerce.

3. ALSC. American Lumber Standard Committee, Inc.; www.alsc.org.
4. APA. APA - The Engineered Wood Association; www.apawood.org.
5. MSBC (780 CMR). Massachusetts State Building Code, Eighth Edition;
<http://www.sec.state.ma.us/spr/sprcat/agencies/780.htm>.
6. NIST. National Institute of Standards and Technology; <http://ts.nist.gov/Standards/Conformity/>.
 - Voluntary Product Standard PS 1 - Structural Plywood.
 - Voluntary Product Standard PS 20 - American Softwood Lumber Standard.

1.04 SUBMITTALS

A. Construction Submittals:

1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
2. Product Data: Provide technical data on wood preservative materials and fire retardant treatment.
3. Certificates: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
 - Wood Moisture Content: Certificates of Grade and kiln drying (KD) by ALSC recognized inspection agency.
 - Fire Retardant Treatment: Certify that fire retardant treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.
 - Preservative Pressure Treated Wood: Treating plant shall certify that chemicals and process used, net amount of salts retained, and conformance with applicable standards. Certify that moisture content was reduced to 19% maximum, after treatment for water borne preservative treatment.
4. Test and Evaluation Reports: Submit test reports by an independent testing laboratory showing reduced strength values and design stress reduction values for all fire retardant wood and plywood

1.05 QUALITY ASSURANCE

A. Regulatory Agency Approvals:

1. Lumber Grading Rules and Wood Species to be in conformance with PS 20.
2. Grading rules of the following associations apply to the materials furnished under this Section:
 - National Lumber Grades Authority (NLGA).
 - West Coast Lumber Inspection Bureau (WCLIB).
 - American Plywood Association (APA).
3. Grade Marks:
 - Identify lumber, mat formed particleboard and plywood by official grade mark.
 - Lumber:
 - Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable, and conditions of seasoning at time of manufacture.
 - S Dry: Maximum 19% moisture content.
 - MC 15: Maximum 15% moisture content.
4. Codes: Wood construction shall conform to the requirements of the "National Design Specifications for Stress Grade Lumber and its Fastenings", of the National Forest Products Associations, and MSBC (CMR 780) requirements.
5. Use of Chromated Copper Arsenate (CCA) type preservative treatment for lumber is prohibited.

1.06 MOCK-UP

- A. The project scope includes a stand-alone mock-up assembly representative of the exterior envelope of the building, and includes the Work of this section and other components of the exterior envelope as described in Section 01 40 00 - Quality Requirements.
- B. The Mock-up assembly shall be constructed, observed, and all corrective actions required by the Architect or Owner shall be completed and mock-up accepted prior to commencing work of building envelope.
- C. Schedule Submittals for products indicated to be used in the mock-up so in sufficient time to allow review prior to the scheduled erection of the mock-up. Allow time for resubmittal and review.
- D. Following acceptance of submittals for material components and selection of colors provide materials of each color selected, installed in place on the mock up for final review by Architect prior to proceeding with the Work.
 - 1. The mock-up shall be constructed full size as indicated in the Drawings, and utilize specified colors and materials.
 - 2. Demonstrate the anticipated range of materials, workmanship and finish expected.
 - 3. Accepted mock-ups will be used as standard of comparison for colors and textures of units, mortar, bond pattern, joint finish. joint reinforcement, anchors, ties, workmanship, and other pertinent details, including proposed method of keeping cavities free of mortar.
 - 4. Modify and/or replace mock-ups as many times as necessary to obtain Architect's and Owner's approval.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with specified requirements, Section 01 60 00, and the following:
 - 1. Immediately upon delivery to job site, place materials in area protected from weather.
 - 2. Store materials a minimum of 6 inches above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation and ventilation.
 - 3. Do not store seasoned materials in wet or damp portions of building.
 - 4. Protect fire retardant materials against high humidity and moisture during shipping, storage and erection.
 - 5. Protect sheet materials from corners breaking and damaging surfaces, while unloading.
 - 6. Damaged products due to improper storage and handling shall be replaced at no cost to the Owner.

1.08 FIELD CONDITIONS

- A. Do not install rough carpentry materials that are wet, moisture damaged, or mold damaged.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
 - 1. Provide warranty of fire retardant wood products against defects in materials or workmanship for a period of not less than 20 years.

(1) PART 2 PRODUCTS

2.01 DESCRIPTION

- A. Regulatory Requirements:
 - 1. Dimension Lumber: Comply with US DoC PS20, and applicable grading rules of the inspection agency, as certified by ALSC's Board of Review for wood species as included in the Work:
 - a. NeLMA Grading Rules: Northeastern Lumber Manufacturers Association.
 - b. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - c. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

- B. Sustainability Characteristics:
 - 1. Lumber fabricated from old growth timber is not permitted.
 - 2. Provide sustainably harvested wood; see Section 01 60 00 for requirements.
 - 3. Provide wood harvested within a 500-mile radius of the project site; see Section 01 60 00 for requirements for locally-sourced products.

2.02 PERFORMANCE / DESIGN CRITERIA

- A. Dimension Lumber for Concealed Applications:
 - 1. Sizes: Nominal sizes as indicated on drawings, S4S.
 - 2. Moisture Content: S-dry or MC19.
 - 3. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - a. Lumber: S4S, No. 2 or Standard Grade.
 - b. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Exterior Plywood Sheathing Panel:
 - 1. Grade: Structural 1 Sheathing; PS2, Grade CD, Exposure 1.
 - 2. Performance Category: 5/8 PERF CAT.
 - 3. Span Rating: 32/16.
 - 4. Edge Profile: Tongue and groove.
- B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

- A. Fasteners and Anchors: Use only fastener and connector types that are compatible with wood treatment used.
 - 1. Metal and Finish:
 - a. Steel Batch Hot-Dip Galvanized (HDG):
 - 1) Fasteners: Hot-dipped galvanized mild steel per ASTM A 153 / A 153M, class D, for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2) Connectors: Hot-dipped galvanized mild steel per ASTM A123.
 - b. Steel Continuous HDG: Hot-dipped galvanized per ASTM A653 with a G90 or G185 coating.
 - c. Exceptions: Provide Type 304 (316 in ocean salt water environments) Stainless Steel connectors and fasteners for pressure treated wood with actual retention levels greater than 0.40 pcf for ACQ or MCQ, 0.41 pcf for CBA-A, or 0.21 pcf for CA-B (with ground contact).
 - 1) Verify retention levels with preservative treatment facility.
 - 2. Anchors:
 - a. Toggle bolt type for anchorage to hollow masonry.
 - b. Bolts shall be square or hexagonal head machine bolts with matching nuts and cut washers.
 - c. Concrete and masonry anchors when not included in the concrete or masonry construction, shall be rust resistant coated machine screws or bolts with standard expansion shield type concrete anchors.
 - 3. Only low velocity type power driven fasteners shall be permitted. Power driven fasteners will not be permitted for use in concrete curbs, along edges of concrete or at concrete joints or in masonry work.

Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 with VOC content of 70 g/L or less, and recommended for indicated use by adhesive manufacturer.

2.05 **FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Do not use treated wood in applications exposed to weather or where the wood may become wet, unless noted otherwise.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Fire Retardant Treatment:
 - 1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Treat all exterior rough carpentry items and all wood bridging the plane of exterior wood sheathing, partly interior and partly exterior.
 - b. Do not use treated wood in direct contact with the ground.
 - 2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Treat rough carpentry items as indicated, and as required by codes, rules and regulations of the authority having jurisdiction (AHJ).
- C. Preservative Treatment:
 - 1. Preservative treatment by Waterborne Pressure Process (P.P.T.): All wood to the exterior of the plane of GWB sheathing or roof deck shall be P.P.T. unless specifically indicated as otherwise in the drawings.
 - a. Acceptable P.P.T. Types:
 - 1) Alkaline Copper Quat: ACQ-D per AWPA P29, or ACQ-B per AWPA P27 (for Western wood).
 - 2) Copper Azole: CA-B per AWPA P32, or CA-C (Wolmanized) per AWPA P48.
 - 3) Sodium Borates: SBX / DOT per AWPA P25; for interior use only.
 - 4) Zinc Borate: ZB per AWPA P51; for interior use only.
 - 5) Micronized Copper Quat: MCQ, and MCA / ?CA-C (EPP certified only).

PART 3 EXECUTION

3.01 **EXAMINATION**

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
 - 1. Carefully examine installation areas for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, surfaces, substrates, structural support, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required, and ready to receive Work.
 - b. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 **INSTALLATION - GENERAL**

- A. General: Install wood blocking as indicated by the Drawings and as required by the Specifications.
 - 1. Install blocking promptly to avoid work delays,
 - 2. Select material sizes to minimize waste.
 - 3. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
 - 4. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.
 - 5. Dissimilar Metal Warning: Do not place hot-dip galvanized and stainless steel components in contact with each other. Use components made of similar, non-reactive metals.

3.03 **BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. Specifically, provide the following non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Window heads, jambs, and sills
 - 7. Wall-mounted door stops.

3.04 **ROOF-RELATED CARPENTRY**

- A. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.
- B. Coordinate installation of roofing related carpentry with deck construction, insulation thickness, framing of roof openings, and roofing assembly installation.

3.05 **INSTALLATION OF CONSTRUCTION PANELS**

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing , using screws.
- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 16 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
 - 4. Size and Location: As indicated on drawings.

3.06 **TOLERANCES**

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 **CLEANING**

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.

2. Do not burn scrap on project site.
 3. Do not burn scraps that have been pressure treated. Collect scrap and legally dispose of.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
 - C. Prevent sawdust and wood shavings from entering the storm drainage system.

3.08 **PROTECTION**

- A. Protect installed work from subsequent construction operations until date of Substantial Completion or Owner Occupancy, whichever occurs first.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Milled wood, and includes but is not limited to, furnishing and installing the following work:
 - 1. Millwork, molding and trim:
 - a. Window sills, casing, stools, and nosing trim.
 - b. Standing and running trim.
 - c. Door trim and casing.
 - 2. Accessories including, but not limited to, fasteners and connectors.
- B. Products Installed by this Section but Furnished from Other Sections:
 - 1. Section 08 11 13 - Hollow Metal Doors and Frames; including setting in place for incorporation into gypsum wallboard and masonry partitions by others.
 - 2. Section 08 14 16 - Flush Wood Doors; including hanging doors within frames and application of glazing stops and door hardware.
 - 3. Section 08 31 00 - Access Doors and Panels.
 - 4. Section 10 14 00 - Signage.
 - 5. Section 10 28 00 - Washroom Accessories.
 - 6. Section 10 44 00 - Fire Protection Specialties : Installation of fire extinguishers and cabinets.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 04 20 00 - Unit Masonry.
 - 2. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
 - 3. Section 08 14 16 - Flush Wood Doors.
 - 4. Section 08 52 13 - Clad Wood Windows.
 - 5. Section 09 29 16 - Gypsum Board Assemblies.
 - 6. Section 09 91 13 - Exterior Painting: Painting and finishing of finish carpentry items.

1.03 DEFINITIONS

- A. Fire-Retardant-Treated Wood is defined in Section 2303.10 of the MSBC (780 CMR) as “any wood product which, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E 84, a listed flame-spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. In addition, the flame front shall not progress more than 10.5 feet (3200 mm) beyond the centerline of the burners at any time during the test.”

1.04 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
1. ALSC. American Lumber Standard Committee, Inc.; www.alsc.org.
 2. ANSI. American National Standards Institute; www.ansi.org.
 - a. ANSI A135.4 - American National Standard for Basic Hardboard.
 - b. ANSI A208.1 - American National Standard for Particleboard.
 - c. ANSI/BHMA A156.9 - American National Standard for Cabinet Hardware; Grade 1.
 - d. ANSI/HPVA HP-1 - Standard for Hardwood and Decorative Plywood.
 - e. ANSI/NEMA LD 3 - High-Pressure Decorative Laminates (HPDL).
 3. APA. APA - The Engineered Wood Association; www.apawood.org.
 4. ASTM. ASTM International; www.astm.org.
 - a. ASTM C1036 - Standard Specification for Flat Glass.
 - b. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
 - c. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 5. AWI. Architectural Woodwork Institute; <http://www.awinet.org>.
 - a. AWI/AWMA/WI (AWS) - Architectural Woodwork Standards.
 6. PS 1 - Structural Plywood.
 7. MSBC (780 CMR). Massachusetts State Building Code, 7th Edition;
<http://www.sec.state.ma.us/spr/sprcat/agencies/780.htm>.
 8. NIST. National Institute of Standards and Technology; <http://ts.nist.gov/Standards/Conformity/>.
 - a. Voluntary Product Standard PS 1 - Structural Plywood.
 - b. Voluntary Product Standard PS 20 - American Softwood Lumber Standard.
 9. OTC (VOC limits). Ozone Transport Commission; www.OTCAIR.org.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.06 SUBMITTALS

- A. Construction Submittals
1. See Section 01 30 00 - Administrative Requirements for submittal procedures.
 2. Product Data:
 - a. Provide data on fire retardant treatment materials and application instructions.
 3. Samples: Submit three samples of finish plywood, 12 x 12 inch in size illustrating wood grain and specified finish.
 4. Samples: Submit three samples of wood trim 6 inch long.
 5. Certificates:
 - a. Submit manufacturer's (Fabricator's) certification, stating that the fabricated work complies with AWI (AWS) and APA quality grades and other requirements indicated.
 - b. Provide certified material FSC-STD-40-004 chain-of-custody from original material resource to project site.
 - c. KD Certificate for kiln-dried moisture content by ALSC recognized inspection agency.

1.07 **QUALITY ASSURANCE**

- A. Regulatory Agency Approvals:
 - 1. Lumber Grading Rules and Wood Species to be in conformance with PS 1.
- B. Sustainability Standards Certifications:
 - 1. Engineered wood shall be made using non-toxic glues, no added formaldehyde, and 100 percent recycled fibers or certified sustainably harvested wood.
 - 2. Composite wood and agrifiber products shall contain no added urea-formaldehyde resins.
 - 3. Wood Treatments: Free of hexavalent chromium, arsenic, halogens, sulfates, and ammonium phosphate.
 - 4. Lumber fabricated from old growth timber is not permitted.
- C. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.08 **DELIVERY, STORAGE, AND HANDLING**

- A. Comply with specified requirements, Section 01 60 00, and the following:
 - 1. Do not deliver woodwork until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas.
 - 2. Do not deliver, store or install finish carpentry items until areas in which items will be stored or installed have been acclimated to a minimum temperature of 70 degrees F, and maximum humidity level of 50 percent.
 - 3. Immediately upon delivery to job site, place materials in area protected from weather.
 - 4. Store materials a minimum of 6 inches above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation and ventilation.
 - 5. Do not store seasoned materials in wet or damp portions of building.
 - 6. Protect fire retardant materials against high humidity and moisture during storage and erection.
 - 7. Protect sheet materials from corners breaking and damaging surfaces, while unloading.
 - 8. Damaged products due to improper storage and handling shall be replaced at no cost to the Owner.

1.09 **FIELD CONDITIONS**

- A. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. Woodwork fabricator shall determine optimum moisture content and required temperature and humidity conditions.

(2) **PART 2 PRODUCTS**

2.01 **FINISH CARPENTRY ITEMS**

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI (AWS) for Premium Grade.

2.02 **WOOD-BASED COMPONENTS**

- A. Regulatory Requirements:
 - 1. Unless otherwise indicated provide products of quality specified by AWI Architectural Woodwork Quality Standards Illustrated for Premium grade.
 - 2. Provide materials having fire and smoke properties as required by applicable code.
 - 3. Dimension Lumber: Comply with US DoC PS1, and applicable grading rules of the inspection agency, as certified by ALSC's Board of Review for wood species as included in the Work:
 - a. NeLMA Grading Rules: Northeastern Lumber Manufacturers Association.

- b. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - c. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.
4. Hardwood Grades per NHLA American Hardwood Lumber Select and No. 1 Common Grades.
 5. Softwood Grades per NeLMA (WWPA) 2 & Better Commons Grade.
- B. Wood fabricated from old growth timber is not permitted.

2.03 LUMBER MATERIALS

- A. Softwood Lumber: spruce species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
- B. Hardwood Lumber: (opaque finish - paint grade) Poplar or Natural Birch species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
- C. Hardwood Lumber (transparent finish):
 1. For chair rail at areas of wood veneer paneling: Cherry species, quarter sawn, kiln dried to a maximum moisture content of 5 to 10 percent per AWI (AWS); with vertical grain, of quality suitable for transparent finish.
 2. For other locations: Cherry species (exposed) and Natural Birch species (unexposed / hidden), quarter sawn, kiln dried to a maximum moisture content of 5-10 percent per AWI (AWS); with vertical grain, of quality suitable for transparent finish.
 3. Color Contrast of Clear Finished Wood: Unless specifically called out, do NOT mix sapwood and heartwood where visible or semi-visible.

2.04 SHEET MATERIALS

- A. Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; glue type as recommended for application.
- B. Hardwood Plywood: Face species Maple species, plain sawn, running matched, medium density fiberboard core; glue type as recommended for application.
- C. Particleboard: ANSI A208.1; composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

2.05 FASTENINGS

- A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.
- B. Fasteners: Of size and type to suit application; mill or coated finish in concealed locations and stainless steel finish in exposed locations.
- C. Concealed Joint Fasteners: Threaded steel.

2.06 ACCESSORIES

- A. Lumber for Shimming, Blocking, and nailers: Softwood lumber of Pine species.
- B. Wood Filler: Solvent base, tinted to match surface finish color.

2.07 WOOD TREATMENT

- A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
- B. Provide identification on fire retardant treated material.
- C. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.
- D. Redry wood after pressure treatment to maximum 6 percent moisture content.

- E. Provide fire retardant treated wood panels at areas of wood wall paneling exceeding 10% of the wall area to which they are mounted, in conformance with building code requirements.

2.08 **FABRICATION**

- A. Expansion / Contraction Movement: Assemble wood products using details that allow for expansion and contraction due to changes in environmental conditions.
- B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.
- C. Shop prepare and identify components for book match grain matching during site erection.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.09 **FINISHING**

- A. General and Shop Finishing:
 - 1. Sand work smooth and set exposed nails and screws.
 - 2. Apply wood filler in exposed nail and screw indentations.
 - 3. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
 - 4. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
 - 5. Transparent:
 - a. System - 2, Lacquer, Precatalyzed.
 - b. Use fire-retardant varnish on all finish carpentry in corridors, lobby, and circulation spaces
 - c. Stain: As selected by Architect.
 - d. Sheen: Flat.
 - 6. Back prime woodwork items to be field finished, prior to installation.
- B. Field Finishing: Section 09 90 00.

(3) **PART 3 EXECUTION**

3.01 **EXAMINATION**

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
 - 1. Carefully examine installation areas for compliance with requirements affecting Work performance.
 - 2. Verify that field measurements, surfaces, substrates, structural support, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required, and ready to receive Work.
 - 3. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 **PREPARATION**

- A. Layout installation by marking extents of each item, and anchoring / fastening locations coordinated with blocking or other structural support.
 - 1. Marks shall be covered up and hidden by installation.
 - 2. Locate areas out-of-level and correct.
 - 3. Protect adjacent substrates, installed work and existing items from damage by construction operations with temporary effective means.
 - 4. Surface Preparation for Coating System: Remove hardware and hardware accessories, plates, and similar items in places that are not to be coated, or provide surface-applied protection prior

to surface preparation and painting Unfinished Wood Surfaces: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper. Sand smooth surfaces exposed to view and dust off.

3.03 INSTALLATION

- A. Install Hollow Metal Doors and Frames in accordance with requirements of Section 08 11 13.
- B. Install Flush Wood Doors in accordance with requirements of Section 08 14 16.
- C. Finishing:
 - 1. Sandpaper finished wood surfaces thoroughly as required to produce a uniformly smooth surface, always sanding in the direction of the grain; except do not sand wood which is designed to be left rough.
 - 2. No coarse grained sandpaper mark, hammer mark, or other imperfection will be accepted.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

3.05 ADJUSTING

- A. Repair damaged and defective woodwork wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

3.06 CLEANING

- A. Waste Management: Comply with Section 01 74 19 - Construction Waste Management and Disposal, applicable regulations, and as follows:
 - 1. Do not burn scrap on project site.
 - 2. Do not burn scraps that have been pressure treated. Collect scrap and legally dispose of.
- B. Cleaning: Clean Woodwork on exposed and semi exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.
- C. Provide Progress Cleaning per Division 01, and as follows:
- D. Work Areas: Continuously clean areas where work is in progress to the level of cleanliness necessary for safety and proper execution of the Work. Ensure this is completed by the end of each workday.
 - 1. Do not allow wood, scraps, shavings, sawdust to remain on the floor, or on the ground or to be buried in fill.
 - 2. Prevent sawdust and wood shavings from entering the storm drainage system.
 - 3. Broom clean and maintain completed construction until Substantial Completion.
- E. Site: Continuously maintain Project site free of waste materials and debris.

3.07 PROTECTION

- A. Protect installed work from subsequent construction operations until date of Substantial Completion or Owner Occupancy, whichever occurs first.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL MILLWORK AND CASEWORK

1.01 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
 - 2. Section 06 20 00 - Finish Carpentry.
 - 3. Section 09 90 00 - Painting and Coating: Field finish.

1.02 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ANSI. American National Standards Institute; www.ansi.org.
 - a. ANSI A135.4 - American National Standard for Basic Hardboard.
 - b. ANSI A208.1 - American National Standard for Particleboard.
 - c. ANSI / BHMA A156.9 - American National Standard for Cabinet Hardware; Grade 1.
 - d. ANSI / HPVA HP-1 - Standard for Hardwood and Decorative Plywood.
 - e. ANSI / NEMA LD 3 - High-Pressure Decorative Laminates (HPDL).
 - 2. APA. APA - The Engineered Wood Association; www.apawood.org.
 - 3. ASTM. ASTM International; www.astm.org.
 - a. E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. AWI. Architectural Woodwork Institute; <http://www.awinet.org>.
 - a. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
 - 5. NIST. National Institute of Standards and Technology; <http://ts.nist.gov/Standards/Conformity/>.
 - a. Voluntary Product Standard PS 1 - Structural Plywood.
 - 6. OTC (VOC limits). Ozone Transport Commission; www.OTCAIR.org.
- B. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association (ANSI/BHMA A156.9).
- C. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components, materials, joint details, accessory listings, hardware location and schedule of finishes, and show relationship and methods of attachments to surrounding construction.
 - 1. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
 - 2. Include certification program label.
- C. Product Data: Provide data for hardware accessories.
- D. Cabinet Hardware Schedule: Submit cabinet hardware schedule for architect's approval prior to fabrication.

1. Do not begin fabrication until architect's approval has been received.
- E. Samples. Submit the following samples for each species and cut or pattern of architectural woodwork:
 1. Initial for Selection: Submit printed color charts or sample chains indicating manufacturer's complete range for each type of prefinished material exposed to view.
 2. Final Selection: Submit samples of each different profile (grain and species for clear finish) with proposed finishes, and fasteners.
 - a. Solid wood with or for transparent finish; set of three (3) pieces, 6 x 3/4 x 18 inches, for each species, finished on one side and one edge.
 - b. Plywood or veneer with or for transparent finish, three (3) finished samples, 12 inches square, for each species and cut.
 - c. Solid wood, plywood or particleboard with factory-applied opaque finish, 12 inches square, for each finish system and color.
 - d. Exposed cabinet hardware, one (1) of each type and finish proposed.
- F. Certificates:
 1. Certificate: Include certification that fire-retardant treated materials comply with requirements indicated.
 2. QCP Certification: Provide inspection and quality certification of completed custom cabinets in accordance with AWI Quality Certification Program.
 3. Provide certified material FSC-STD-40-004 chain-of-custody from original material resource to project site.
 4. KD Certificate for kiln-dried moisture content by (ALSC) recognized inspection agency.

1.04 **CLOSEOUT SUBMITTALS**

- A. See Section 01 78 00 - Closeout Submittals, for submittal procedures.
- B. Warranty: Executed warranty.

1.05 **QUALITY ASSURANCE**

- A. Regulatory Agency Approvals:
 1. Fire Retardant Marking: Mark each unit of fire-retardant treated wood and plywood with producer's label and U.L. label showing grade and rating. Mark on surface that will not be exposed after installation.
- B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum 10 years of documented experience.
 1. Member in good standing of the Architectural Woodwork Institute (AWI) or the Architectural Woodwork Manufacturers Association of Canada (AWMAC) or the Woodwork Institute (WI), and is familiar with the AWI Quality Certification Program (QCP).
- C. Single Source Responsibility: Arrange for architectural woodwork with sequence matched wood veneers to be produced by a single firm.

1.06 **DELIVERY, STORAGE, AND HANDLING**

- A. See Section 01 60 00 Product Requirements, for additional requirements.
- B. Protect units from moisture damage.

1.07 **FIELD CONDITIONS**

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

1.10 **WARRANTY**

- A. Fabricator / Special Warranty: Prepare and submit in accordance with Section 01 78 00 - Closeout Submittals.
 1. Casework Warranty: Contractor shall provide fabricator's three (3) year guarantee against structural defects in materials and workmanship beginning on the date of Substantial Completion acceptance.

- a. Defective piece(s) shall be repaired or replaced at the discretion of the fabricator, in a timely manner.

PART 2 PRODUCTS

2.01 DESCRIPTION

- A. Regulatory Requirements:
 1. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI Architectural Woodwork Standards for Premium Grade.
 2. Hardwood Grades per NHLA American Hardwood Lumber Select and No. 1 Common Grades.
- B. Sustainability Characteristics:
 1. Lumber fabricated from old growth timber is not permitted.

2.02 MATERIALS - PANEL

- A. Veneer Faced Plywood Finish: HPVA HP-1; graded in accordance with AWS, core of veneer (wood plies), particleboard, or medium density fiberboard; type of glue recommended for specific application; thickness as indicated.
- B. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI (AWS); composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.
- C. Plywood for Non-Decorative Purposes: NIST PS 1, Interior rated adhesives, core of wood plies from listed species unless otherwise indicated, thickness as indicated or as required by application.
 1. Concealed Surfaces: PS 1; APA B-B Grade, rotary cut Douglas fir face veneer.

2.03 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.04 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized finish in concealed locations and stainless steel finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic wire grommets for cut-outs, in color to blend with adjacent surface.

2.05 HARDWARE

- A. Fixed Shelf Bracket Standards: Heavy-Duty Commercial style, white enamel finish
 1. Basis-of-Design Manufacturer / Product: Knape & Vogt / 208 series, or an Architect acceptable equivalent products subject to compliance with requirements from one of the manufacturers listed above.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.
 1. Basis-of-Design Product: 85 series Standard and 185 Series Bracket System manufactured by Knapt & Vogt, or an Architect acceptable equivalent products subject to compliance with requirements from one of the manufacturers listed above.
- C. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch spacing adjustments.
 1. Basis-of-Design Product: 85 Series Standard and 185 Series Bracket System manufactured by Knapt & Vogt, or an Architect acceptable equivalent products subject to compliance with

requirements from one of the manufacturers listed above.

2.06 FABRICATION

- A. Assembly:
- B. Adjustable Shelves:
 - 1. Exposed shelves shall be hardwood plywood, surfaces faced with specified veneers.
 - 2. Non-exposed shelves shall be hardwood plywood, surfaces faced with sound hardwood veneers.
 - 3. A 3/4 inch thick hardwood nosing shall be applied to the exposed front edge and rear of shelves.
 - 4. Shelves shall be full depth and adjustable on 1-1/4 inch centers.
- C. Fixed Shelves:
 - 1. Exposed shelves shall be hardwood plywood, surfaces faced with hardwood veneers of species cut and grain specified.
 - 2. Non-exposed shelves shall be hardwood plywood, surfaces faced with birch veneers.
 - 3. All non-supported fixed shelves and exposed shelves shall be 1 inch thick.
 - 4. All supported fixed shelves shall be 3/4 inch thick.
 - 5. Shelves shall be full depth and be secured to cabinet sides or partitions with multiple hardwood dowels, glued and screwed.
- D. Edging: Fit shelves, doors, and exposed edges of carcass panels, doors and drawers with hardwood edge banding. Do not use more than one piece for any single length. Species of edging shall match veneer specified.
 - 1. Banding shall be 3/8 inch thick hardwood unless specified as otherwise elsewhere in this section.

2.07 FINISHING

- A. Shop Finishing: To the greatest extent possible, finish architectural woodwork at shop or factory. Defer only final touch up, cleaning and polishing for time after delivery and installation.
- B. Sand work smooth and set exposed nails and screws.
- C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.
- D. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:
 - 1. Transparent:
 - a. System - 2, Lacquer, Precatalyzed.
 - b. Stain: As selected by Architect.
 - c. Sheen: Flat.
 - 2. Opaque Finish: One shop coat application applied on all sides.
 - a. Basis-of-Design Manufacturer / Product: Benjamin Moore-Moorecraft / Superspec Alkyd Enamel Undercoater Primer Sealer 245, or an Architect acceptable equivalent products subject to compliance with requirements from one of the following manufacturers:
 - 1) Sherwin-Williams Company; www.sherwin-williams.com.
 - 2) Glidden Professional; www.gliddenprofessional.com.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
 - 3. Provide touch up on site after final cuts.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:

- B. Carefully examine installation areas with Installer present, for compliance with requirements affecting Work performance.
 - 1. Verify that field measurements, surfaces, substrates, structural backing and support, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required, and ready to receive Work.
 - a. Verify mechanical, electrical, and other building items affecting work of this section are placed and ready to receive this work.
 - 1) Verify location and sizes of utility rough-ins.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 **PREPARATION**

- A. Layout installation by marking extents of each item, and anchoring / fastening locations coordinated with blocking or other structural support.
 - 1. Marks shall be covered up and hidden by installation.
 - 2. Locate areas out-of-level and correct.
 - 3. Protect adjacent substrates, installed work and existing items from damage by construction operations with temporary effective means.

3.03 **INSTALLATION**

- A. Install finish wood according to AWI (AWS) PREMIUM standard, as indicated by the Drawings, and as required by the Specifications.
- B. Install the work plumb, level, true, and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including countertops); and with 1/16 inch maximum offset in flush adjoining surface, 1/8 inch maximum offsets in revealed adjoining surfaces. Produce joints that are true, tight, and well nailed with all members assembled in accordance with the drawings.
- C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- D. Standing and Running Trim: Provided by Section 06 20 00.
- E. Fire Retardant Woodwork: Handle, store, and install in accordance with manufacturer's directions and as required to meet required classification or rating. Provide special fasteners, moldings, adhesives and other accessories as tested and listed for type of fire retardant woodwork indicated.
- F. Jointing:
 - 1. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
 - 2. Use fixture attachments in concealed locations for wall mounted components.
 - 3. Secure cabinets to floor using appropriate angles and anchorages.
 - 4. Use concealed joint fasteners to align and secure adjoining cabinet units.
 - 5. Make joints to conceal shrinkage; miter exterior joints; cope interior joints; miter or scarf end-to-end joints.
 - 6. Install trim in pieces as long as possible, jointing only where solid support is obtained.
- G. Fastening:
 - 1. Install items straight, true, level, plumb, and firmly anchored in place.
 - 2. Where blocking or backing is required, coordinate as necessary with other trades to ensure placement of required backing and blocking in a timely manner.
 - 3. Nail trim with finish nails of proper dimension to hold the member firmly in place without splitting the wood.
 - 4. Nail exterior trim with galvanized nails, making joints to exclude water and setting in waterproof glue or the sealant described in Section 07 90 05.
 - 5. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces. For exposed nailing work, set nails for putty.
 - 6. Screw, do not drive, wood screws; except that screws may be started by driving and then screwed home.
 - 7. Where fasteners are highly visible, pay close attention to ensuring that fasteners and plugs are aligned and equally spaced.

- H. Anchor woodwork to anchors or blocking built-in or directly attached to substrates.
 - 1. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
 - 2. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.
- I. Exposed Wood: Cleats, nailers and other required supports shall be finished lumber.
- J. Install glass, mirrors, glazing and accessories in accordance with GANA (GM) and GANA (TIPS).
- K. Finishing:
 - 1. Sandpaper finished wood surfaces thoroughly as required to produce a uniformly smooth surface, always sanding in the direction of the grain; except do not sand wood which is designed to be left rough.
 - 2. No coarse grained sandpaper mark, hammer mark, or other imperfection will be accepted.

3.04 **ADJUSTING**

- A. Adjust moving or operating parts to function smoothly and correctly.
 - 1. Clean Hardware, lubricate and make final adjustments for proper operation.
- B. Repair damaged and defective woodwork wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

3.05 **CLEANING**

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal
- B. Clean casework, counters, shelves, hardware, fittings, and fixtures. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the Work, free from accumulation of sawdust, cut ends, and debris.
- C. Clean Woodwork on exposed and semi exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.
- D. Sweeping:
 - 1. At the end of each working day, and more often if necessary, thoroughly sweep surfaces where refuse from this portion of the Work has settled.
 - 2. Remove the refuse to the area of the job site set aside for its storage.
 - 3. Upon completion of this portion of the Work, thoroughly broom clean all surfaces.

3.06 **PROTECTION**

- A. Protect installed work from subsequent construction operations until date of Substantial Completion or Owner Occupancy, whichever occurs first.
- B. Protection: Installer of architectural woodwork shall advise Contractor of procedures required to protect architectural woodwork during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION

SECTION 06 65 00

PART 1 GENERAL

PLASTIC SIMULATED WOOD TRIM

1.01 SECTION INCLUDES

- A. Free Foam Cellular PVC Trim Boards, corner boards, soffits, fascias, battens, door and window pilasters, frieze boards, rake boards, water tables, window and door trim, porch ceiling, column wrap .

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract General requirements of the Project Manual apply to this Subcontractor, material supplier, and other persons furnishing labor and materials under this section. General Conditions, Supplementary Conditions and applicable parts of Division 01 are included as part of this section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 06 10 00 - Rough Carpentry: Siding substrate.
 - 2. Section 07 21 00 - Thermal Insulation.
 - 3. Section 07 25 00 - Weather Barriers: Weather barrier under siding.
 - 4. Section 07 46 46 - Fiber Cement Siding
 - 5. Section 07 90 05 - Joint Sealers.
 - 6. Section 08 10 00 - Doors and Frames.
 - 7. Section 09 21 16 - Gypsum Board Assemblies: Siding substrate
 - 8. Section 09 90 00 - Painting Exterior trim.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM D 792 - Density and Specific Gravity of Plastics by Displacement
 - 2. ASTM D 570 - Water Absorption of Plastics
 - 3. ASTM D 638 - Tensile Properties of Plastics.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Construction Submittals
 - 1. Product Data: Manufacturer's data sheets on each product to be used, including:
 - a. Manufacturer's requirements for related materials to be installed.
 - b. Preparation instructions and recommendations.
 - c. Storage and handling requirements and recommendations.
 - d. Installation methods, including nail patterns.
 - 2. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).
 - 3. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
 - 4. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.

SECTION 06 65 00-1

5. Submit shop drawings show all elevations to receive siding with dimensions. Show exposure to scale on drawings. Include a detail for each specific condition including, but not limited to: top of siding, base of siding, edge of siding at windows and doors, inside and outside corners, and connection to adjacent materials at a scale that is easy to read and understand. Details shall indicate type, size, and spacing of all fasteners, plank thickness, and finish. Show all joints and weatherproofing.
6. Submit samples of each product specified including planks, trim, fasteners, rain screen flashing, and all other accessories.

C. Closeout Submittals

1. Submittal Procedures per Section 01 78 00, and as follows:
 - a. Warranty Documentation: Executed warranties.
 - b. Operation and Maintenance Data: Operating, cleaning and maintenance recommendations.
 - 1) Basic owner requirements to maintain warranty
 - 2) Recommended maintenance guidelines and maintenance schedule.

1.05 **MOCK-UP**

The project scope includes a stand-alone mock-up assembly representative of the exterior envelope of the building, and includes the Work of this section and other components of the exterior envelope as described in Section 01 40 00 - Quality Requirements.

Schedule Submittals for products indicated to be used in the mock-up so in sufficient time to allow review prior to the scheduled erection of the mock-up. Allow time for resubmittal and review.

Following acceptance of submittals for material components and selection of colors provide materials of each color selected, installed in place on the mock up for final review by Architect prior to proceeding with the Work.

The mock-up shall be constructed full size as indicated in the Drawings, and utilize specified colors and materials.

Demonstrate the anticipated range of materials, workmanship and finish expected.

Accepted mock-ups will be used as standard of comparison for colors and textures of units, mortar, bond pattern, joint finish. joint reinforcement, anchors, ties, workmanship, and other pertinent details, including proposed method of keeping cavities free of mortar.

Modify and/or replace mock-ups as many times as necessary to obtain Architect's and Owner's approval. Do not start work until mock-ups are accepted by Owner and Architect.

1.06 **QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 5 of experience. The installer must list five similar projects prior to commencement of work. This list shall include project name, location, scope and Architect.
- B. Building Envelope Commissioning will be provided for this project by the Owner. This subcontractor shall cooperate fully with the Building Commissioning Agent to provide access for testing of installed materials, and to repair or remediate conditions identified by the Building Commissioning Agent in order to obtain his acceptance of installed work.

1.07 **DELIVERY, STORAGE, AND HANDLING**

- A. Store products under waterproof cover and elevated above grade, on a flat surface.

PART 2 PRODUCTS

2.01 **Exterior Trim**

- A PVC: Free Foam Cellular PVC Material with small cell microstructure and density of .55 grams/cm(3)

1. Mechanical: Tensile Strength 3582 psi
2. Texture: Smooth.
3. Water Absorption: Less than 0.50 Percent when tested in accordance with ASTM D 570.
4. Flexural Strength: 5179 psi
5. Thickness: 5/16 inch, nominal.
6. Color: To be painted white
7. Manufacturer Warranty: 30 year limited; transferable.
8. Manufacturers:
 - a. Versatex.
 - b. Basis of Design: James Hardie Building Products, Inc : www.jameshardie.com.
 - c. Nichiha USA, Inc : www.nichiha.com.

2.02 ACCESSORIES

- A Furring Strips: Galvanized metal channels.
- B Use 12 Gauge stainless steel fasteners, fasteners
- C
- D Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.
 1. Electro galvanized nails and staples are not permitted.
 2. Fasteners shall fit snug against siding (no air space). Do not over drive nail heads or drive nails at an angle.
- E Joint Sealer: As specified in Section 07 90 05.
- F ALUMINUM FLASHING TAPE: Polyken Foilastic 626-35 Flashing Tape or approved equivalent. This is a peel and stick, aluminum flashing tape, with butyl rubber adhesive. Select from 6", 9", or 12" widths as required by project conditions. www.tycoadhesives.com
- G Siding Manufacturer, color-match exterior caulking or approved equivalent.
- H Siding manufacturer, touch-up painting kits.
- I Aluminum Flashing at all window and door heads

PART 3 EXECUTION

3.01 PREPARATION

- A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Verify that water-resistive barrier has been installed over substrate completely and correctly.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is the responsibility of another installer, notify General Contractor of unsatisfactory preparation before proceeding.
- E. Install sheet metal flashing:
 - 1. Above door and window trim and casings.
 - 2. Above horizontal trim in field of siding.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with all terms necessary to maintain warranty coverage.
 - 2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
 - 3. Use trim details indicated on drawings.
 - 4. Touch up all field cut edges before installing.
 - 5. Pre-drill nail holes if necessary to prevent breakage.
 - 6. Siding shall be blind nailed.
 - 7. Allow space between both ends of siding panels that butt against trim for thermal movement; seal joint between panel and trim with exterior grade sealant.
 - 8. Place fasteners no closer than 3/8" from the edge of plank.
- 9. Locate splices at least 12 inches away from window and door openings.
- 10. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- 11. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.
- 12. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- 13. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations.
- 14. Finish Paint touch up. Apply factory supplied touch up paint, matching color of installed material, to all exposed fasteners.
- 15. Finish all soffit materials in accordance with Section 09900 Painting.

3.03 CLEANUP:

- A. Under the Special Conditions, the General Contractor will provide temporary trash containers for use by all trades, and will haul away and replace the containers at sufficient intervals such that they will be continuously in condition to receive trash and refuse.
- B. During the course of the work at the end of each work day, this Subcontractor shall clean up all trash and debris caused by the work of this Section, including, but not limited to, all discarded materials, discarded cartons; emptied containers; rubble; debris; spent cartridges, accessories and other devices; and other similar refuse, and
(1) deposit them in the temporary containers so provided or (2), should the Subcontractor prefer haul them off the site and legally dispose of them at the Subcontractor's expense. Such cleaning shall be sufficient to result in generally "broom-clean" or raked-clean site" conditions, as applicable.
- C. Perform final cleaning and trash and debris removal, upon final completion of the work of this Section, in similar manner. Such cleaning shall be in addition to, and not in lieu of, other cleaning specified in this Section and elsewhere in the Contract Documents.
- D. Contractor shall use magnetic nail collector or other suitable equipment necessary to remove all nails and scrap metal from the project site.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before substantial Completion.

SECTION 07 00 02

ROOFING AND FLASHING AND SHEET METAL FILED SUB-BID SUMMARY

PART 1 GENERAL

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this Filed Sub-Bid section shall include all furnishing and installation of roofing systems as shown in the drawings, as described in the Specifications, or as reasonably inferred from either, in the opinion of the Architect.
- B. The Work of this Filed Sub-Bid Section may be (but is not necessarily always) indicated in the drawings with the note "by roofing contractor or roofing subcontractor".
- C. The Work of this Filed Sub-Bid section shall include the scope of each of the following Sections in their entirety:
 - 1. 07 31 13 - Asphalt Shingles.

- 07 53 00 - Elastomeric Membrane Roofing.
- 2. 07 62 00 - Sheet Metal Flashing and Trim.
- 3. 07 72 00 - Roof Accessories.
- D. The Work of this Filed Sub-Bid Section shall include a portion of the work of each of the following sections:
 - 1. Section 07 21 19 - Foamed in Place Insulation: spray foam insulation for filling and sealing cracks in insulation board products.
- E. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- G. Waste Removal/Dumpster: This Filed Sub-Bid Subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- H. Temporary Heat: This Filed Sub-Bid Subcontractor shall be responsible for providing adequate enclosure of their work area, which shall include erection of tenting or other similar enclosure of scaffolding prior to enclosure of the building. This General Contractor shall be responsible for providing heat to the exterior work area of this Section including tented scaffolding, and heat to the work areas within the building footprint once the superstructure and enclosing walls are erected to a point where temporary enclosure is practical.
- I. Cutting and Patching: This Filed Sub-Bid Subcontractor shall be perform all cutting, coring, and/or patching required to complete the work of this section, except as specifically indicated in respective sections listed as part of the work of this Filed Sub-Bid. Where any of these sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching necessary for the work of this section shall be borne by this Subcontractor. All cutting, coring, and patching shall be coordinated through and by the General Contractor. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- J. Special Requirements:
 - 1. Roofing Contractor Warranty: The Applicator shall supply the Owner with a 3-year warranty separate from the manufacturer warranty, as described in the individual Specification Sections. This warranty shall cover the entire roofing system on the Project. In the event any work related to roofing, flashing, or metal is found to be defective or otherwise not in accordance with the Contract Documents within this warranty term, the Contractor(s) shall repair that defect at no cost to the Owner. This warranty obligation shall run directly to the Owner, and a copy shall be sent to the manufacturer and Architect. The form of guaranty is annexed to this section of the specifications.
- K. This Filed Sub-Bid Subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements of the following Sections:
 - 1. Section 04 20 00: UNIT MASONRY.
 - 2. Section 05 12 00: STRUCTURAL STEEL FRAMING.
 - 3. Section 06 10 00: ROUGH CARPENTRY.

4. Section 07 21 00: THERMAL INSULATION.
 5. Section 07 25 00: WEATHER BARRIERS.
 6. Section 07 46 46: FIBER CEMENT SIDING.
 7. Division 22: PLUMBING Sections.
 8. Division 23: HVAC Sections.
 9. Division 26: ELECTRICAL Sections.
- L. Primary Drawings listed are those intended to indicate the Scope of Work for this trade. Additionally, ALL Subcontractors must include in the List of Drawings, "AG" series General Information sheets, "GC" series Code Plans, and "GP" series Phasing Plans, including all project detail sheets for general and code-related information, installation or other conditions and instructions that directly affect their work.
1. List of Primary Drawings: T-1.1,A-0.1,A-0.2, A-1.3, A-2.1, A-2.2, A-2.3, A-2.4, A-3.2, A-3.3, A-3.4, A-3.5, A-3.6, A-3.6A, A-3.7,A-3.8,A-3.11, A-3.12, A-3.13,A-3.14,M-1.2, M-1.3, M-1.4,P-1.2, P-1.3.
- M. In addition to the above listed "Primary Drawings" that define the scope of this section, this Filed Sub-Bid Subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 **RELATED REQUIREMENTS**

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- D. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- E. Section 01 41 00 - Regulatory Requirements.
- F. Section 01 50 00 - Temporary Facilities and Controls.
- G. Section 01 57 21 - Indoor Air Quality Controls: Procedures and testing.
- H. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. See Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 **REFERENCE STANDARDS**

- A. Refer to individual specification sections for reference standards.

1.06 **SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to individual specification sections listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 **QUALITY ASSURANCE**

- A. Refer to individual specification sections listed above for Quality Assurance requirements.

1.08 **MOCK-UP**

- A. The project scope includes a stand-alone mock-up assembly representative of the exterior envelope of the building, and includes the Work of this section and other components of the exterior envelope as described in Section 01 40 00 - Quality Requirements.
- B. The pertinent contractors and subcontractors shall erect the Mock-Up assembly for review by the Architect and Owner, and all corrective actions and replacement of unsatisfactory work identified by the Architect completed by the Contractors and accepted as the standard for execution of the work and the materials proposed prior to commencement of the work on the building envelope.
- C. Schedule Submittals for products indicated to be used in the mock-up so in sufficient time to allow review prior to the scheduled erection of the mock-up. Allow time for resubmittal and review.
- D. Following acceptance of submittals for material components and selection of colors provide materials of each color selected, installed in place on the mock up for final review by Architect prior to proceeding with the Work.
 - 1. The mock-up shall be constructed full size as indicated in the Drawings, and utilize specified colors and materials.
 - 2. Demonstrate the anticipated range of materials, workmanship and finish expected.
 - 3. Accepted mock-ups will be used as standard of comparison for colors and textures of units, mortar, bond pattern, joint finish, joint reinforcement, anchors, ties, workmanship, and other pertinent details, including proposed method of keeping cavities free of mortar.
 - 4. Modify and/or replace mock-ups as many times as necessary to obtain Architect's and Owner's approval.
 - 5. Do not start masonry work until mock-ups are accepted by Owner and Architect.
- E. Mock-up may not remain as part of the Work.

1.09 **WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Refer to individual specification sections listed above for specific warranty requirements, and special requirements listed above in this section.

PART 2 PRODUCTS (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR PRODUCT REQUIREMENTS)

PART 3 EXECUTION (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR EXECUTION REQUIREMENTS)

3.01 **CLEANING**

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 07 13 00

SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following work:
 - 1. Blind-side waterproofing under pits as indicated on drawings.
 - 2. Sheet waterproofing for vertical installation at pit foundation walls as indicated on drawings.
 - 3. Accessories required for a complete installation, including but not limited to waterstops and lap tapes and sealants.
 - 4. Accessories required for a complete installation, including but not limited to waterstops and lap tapes and sealants.
 - 5. Waterstops to be provided to Section 03 30 00 - Cast in Place Concrete Subcontractor for installation with the concrete work.
 - 6. Protection board: Rigid insulation to be furnished and installed by Section 07 21 00. Coordinate sequence of installation such that protection board is installed promptly after installation of waterproofing and drainage board to protect materials until backfilled.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this subcontractor must coordinate the work of this section include the following:
 - 1. Section 03 30 00 - Cast-in-Place Concrete: Concrete substrate; underslab vapor retarder to be sealed to waterproofing
 - 2. Section 07 21 00 - Thermal Insulation: Insulation used for protection board.
 - 3. Section 07 90 05 - Joint Sealers: Sealant for joints in substrates.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 - 2. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers- Tension.
 - 3. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
 - 4. ASTM D624 - Standard Test Method For Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - 5. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
 - 6. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - 7. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 - 8. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - 9. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test).
 - 10. ASTM D2240 - Standard Test Method For Rubber Property--Durometer Hardness.

11. ASTM D2581 - Standard Specification for Polybutylene (PB) Plastics Molding and Extrusion Materials.
12. ASTM D3786 - Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics--Diaphragm Bursting Strength Tester Method.
13. ASTM D4068 - Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane.
14. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
15. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
16. ASTM D4716 - Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
17. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
18. ASTM D5295/D5295M - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems.
19. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.
20. ASTM D6134 - Standard Specification for Vulcanized Rubber Sheets Used in Waterproofing Systems.
21. ASTM D6506 - Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing.
22. ASTM E96/E96M - Standard Test Methods For Water Vapor Transmission of Materials.
23. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
24. ASTM F2130 - Standard Test Method for Measuring Repellency, Retention, and Penetration of Liquid Pesticide Formulation Through Protective Clothing Materials.
25. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association.

1.04 **SUBMITTALS**

A. Construction Submittals

1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
2. Product Data: Provide data for membrane, flexible flashings, and joint and crack sealants.
3. Certificate: Certify that products meet or exceed specified requirements, and are compatible with adjacent materials.
4. Installer qualifications: Certify that the installer is approved, trained and certified by the manufacturer as an installer of the proposed systems. List completed projects.
5. Manufacturer's Installation Instructions: Indicate special procedures.
6. Subcontractor's written acknowledgement of acceptance of substrate conditions as acceptable to receive products of this section. Submit prior to commencement of installation of products of this section.
7. Manufacturer's written inspection report documenting acceptance of waterproofing installation. Submit within 5 days of completion of waterproofing application.

B. Closeout Submittals

1. Submittal Procedures per Section 01 78 00, and as follows:
 - a. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 **QUALITY ASSURANCE**

- A. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with 20 years experience manufacturing the products of this section.
- B. Installer Qualifications: Company specializing in performing the work of this section with

minimum five years experience.

1. Written confirmation or certification from the Waterproofing Manufacturer that the installer has been trained and is recognized by the manufacturer as suitable for the execution of the work.
 2. List of at least three projects contracted within the past five years of similar scope and complexity to this project carried out by the firm and site supervisor.
- C. Single Source Responsibility: Furnish system materials from one manufacturer for entire Project, unless otherwise acceptable to Architect.
- D. Certifications: Verify products are compatible with each other and with specified underslab vapor barrier, insulation, and dampproofing.

1.06 **FIELD CONDITIONS**

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.
- B. Ambient Conditions: Perform work only when existing and forecast weather conditions are within the limits established by the manufacturer of the materials used.
1. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive the air and vapor barrier membrane.

1.07 **WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water.

(1) **PART 2 PRODUCTS**

2.01 **WATERPROOFING APPLICATIONS**

- A. Self-Adhered Modified Bituminous Sheet Waterproofing: Use at sides of elevator pits and other pits below floor slabs.
- B. Composite HDPE Non-Bentonite Sheet Waterproofing: Use under pit raft slabs, and pit walls below adjacent slab on grade.
1. Vertical Surfaces: Adhesive bonded to substrate.
 2. Horizontal Surfaces: Adhesive bonded to substrate.

2.02 **MEMBRANE MATERIALS**

- A. Self-Adhered Modified Bituminous Membrane:
1. Thickness: 60 mil (0.060 inch).
 2. Sheet Width: 36 inches.
 3. Tensile Strength:
 - a. Film: 5000 pounds per square inch, minimum, measured according to ASTM D882 and at grip-separation rate of two inches per minute.
 4. Elongation at Break: 300 percent, minimum, measured according to ASTM D412.
 5. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M.
 6. Puncture Resistance: 50 pounds, minimum, measured in accordance with ASTM E154/E154M.
 7. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
 8. Manufacturers:
 - a. Carlisle Coatings & Waterproofing Incorporated; MiraDRI 860/861: www.carlisle-ccw.com.
 - b. Grace Construction Products; Product Bituthene System 4000: www.na.graceconstruction.com.
 - c. W.R. Meadows, Inc; MEL-ROL XLT: www.wrmeadows.com.
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified

products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.

- B. HDPE Based Sheet Membrane: Comprised of HDPE with spun polypropylene fabric facing, and pressure sensitive adhesive and weather resistant protective coatings.
 - 1. Minimum Thickness: 0.046 inch.
 - 2. Provide compatible waterstop devices recommended by manufacturer for non-moving construction joints.
 - a. Provide waterstop devices to Cast-In-Place Concrete Subcontractor for placement with the pour.
 - 3. Tensile Strength: minimum 5000 psi, (film) measured in accordance with ASTM D412.
 - 4. Ultimate Elongation: 350 percent, measured in accordance with ASTM D412.
 - 5. Manufacturers:
 - a. Grace Construction Products; Product Preprufe 200.
 - b. W.R. Meadows; Product: Mel-Rol Precon.
 - c. Carlisle Coatings and Waterproofing; Product: MiraDRI.
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.
- C. Seaming Materials: Tapes as recommended by membrane manufacturer.
- D. Membrane Sealant: As recommended by membrane manufacturer.
- E. Surface Conditioner: bituthene type, compatible with membrane.
- F. Adhesives: As recommended by membrane manufacturer.
- G. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

2.03 ATTACHMENT MATERIALS

- A. Sheets over 8' in length may require mechanical fastening. Follow manufacturers recommendations and requirements.

2.04 ACCESSORIES

- A. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.
- B. Protection Board: Rigid insulation specified in Section 07 21 00.
- C. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.
 - 1. Composition: Dimpled polystyrene core with polypropylene filter fabric adhered to surface of dimples.
 - 2. Properties:
 - a. Compressive strength: 15,000 psf per ASTM D1621mod.
 - b. Thickness: 0.40 inches (minimum).
 - 3. Products:
 - a. W.R. Meadows, Inc; Mel-Drain 5035-B: www.wrmeadows.com.
 - b. Grace Construction Products; Hydroduct 220.
 - c. Carlisle; Mira DRAIN 6200XL.
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.
- D. Cant Strips: Premolded composition material approved or recommended by waterproofing manufacturer.
- E. Water Stops: As recommended by waterproofing manufacturer for product and application.

(2) PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.
- D. Submit contractor's written acceptance of substrate conditions prior to commencement of installation.

3.02 PREPARATION

- A. Provide waterstops to Cast-In Place Concrete Subcontractor for placement with the pour, and review manufacturer's installation instructions.
- B. Protect adjacent surfaces not designated to receive waterproofing.
- C. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- D. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- E. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.
- F. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.
- G. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate according to ASTM D5295.
 - 1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
 - 2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in the reference standard.
 - 3. Remove and replace areas of defective concrete as specified in Section 03 30 00.
 - 4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in the referenced standard.
 - 5. Test concrete surfaces as described in the referenced standards. Verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

3.03 INSTALLATION - MEMBRANE

- A. General: Install Sheet Waterproofing according to the Drawings, approved submittals, manufacturer's instructions, and as follows:
 - 1. Roll out membrane. Minimize wrinkles and bubbles.
 - 2. Self-Adhering Membrane: Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.
 - 3. Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build-up of layers.
 - 4. Leave the plastic release liner in position until overlap procedure is completed.
 - 5. Accurately position succeeding sheets to overlap the previous sheet as recommended by the manufacturer, but not less than 3" (75mm) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap.
 - 6. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller.
 - 7. Completely remove the plastic liner to expose the protective coating. Any initial tack shall quickly disappear.
 - 8. Overlap edges and ends and seal by method recommended by manufacturer, minimum three inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
 - 9. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

10. Seal membrane and flashings to adjoining surfaces.
11. Apply surface conditioner at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.
12. Delay application of membrane until surface conditioner is completely dry. Dry time will vary with weather conditions.
13. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with additional layer of membrane or detail tape.
14. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.
15. Install sheet waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.
16. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
17. Arrange for Manufacturer's technical representative to visit site to inspect installation of waterproofing within 5 days of completion of waterproofing application, and as otherwise necessary to inspect blind side waterproofing and required to provide warranty. Submit Manufacturer's written acceptance of waterproofing systems prior to covering with drainage panel, protection board, and backfill.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

- A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.
- B. Coordinate installation of protection board immediately following installation of drainage panels and prior to backfilling.

3.05 FIELD QUALITY CONTROL

- A. On completion of horizontal membrane installation, dam installation area in preparation for flood testing.
- B. Flood to minimum depth of one inch with clean water. After 48 hours, inspect for leaks.
- C. If leaking is found, remove water, repair leaking areas with new waterproofing materials and repeat flood test. Repair damage to building.
- D. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane until concrete is poured.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

ART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and erecting the following thermal insulation work:
 - 1. Mineral Fiber laid loose above finished ceilings for sound attenuation.
 - 2. Mineral fiber insulation used as smoke sealing within stud spaces at framed edges.
 - 3. Insulation elsewhere not specifically indicated to be provided by other divisions, including, but not limited to filling miscellaneous voids.

- B. Insulation products specified in this section to be furnished and installed by other Sections includes:
 - 1. Insulation board installed below slab-on-grade construction shall be provided and installed by Section 03 30 00 - Cast In Place Concrete and Sheet Waterproofing Contractor
 - 2. Rigid Insulation board and vented nailbase insulation within roofing assemblies shall be provided and installed by the roofing trade contractor. Refer to Section 07 00 02 - Roofing, Flashing, and Sheet metal Filed Sub-Bid Summary.
 - 3. Acoustical batt insulation within non-loadbearing stud partitions shall be furnished and installed by Section 09 21 16 - Gypsum Board Assemblies.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.

- B. Work which this contractor must coordinate with and/or accommodate the Work of, or which contain requirements that affect the Work of this section include the following:
 - 1. Section 03 30 00 - Cast In Place Concrete: slabs on grade, foundation walls and footings to receive insulation, and underslab vapor barriers.
 - 2. Section 07 13 00 - Sheet Waterproofing: blind side waterproofing applications on top of insulation under footings.
 - 3. Section 07 21 19 - Foamed in Place Insulation: spray foam insulation applied to surfaces at and beyond building envelope, which may come in contact with rigid board.
 - 4. Section 07 25 00 - Weather Barriers: VR/AIB membranes applied to above-grade walls prior to application of insulation.
 - 5. Section 07 31 13 - Asphalt Shingles.
 - 6. Section 07 46 46 - Fiber Cement Siding.
 - 7. Section 07 84 00 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.
 - 8. Section 09 21 16 - GYPSUM BOARD ASSEMBLIES: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM. ASTM International; www.astm.org.
 - a. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

- b. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - c. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - d. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - e. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - f. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
 - g. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - h. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
 - i. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.
- 2. NFPA - National Fire Protection Association:
 - a. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.
 - 3. UL Underwriters Laboratories Inc.:
 - a. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc..

1.04 SUBMITTALS

A. Construction Submittals:

- 1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
- 2. Product Data: Provide data on product characteristics, performance criteria, and product limitations. Provide manufacturer's catalog data for each type and size of insulation to be used, with a schedule indicating product type by application.
- 3. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.
- 4. Certification from the roofing system manufacturer that the insulation proposed for the roofing system is approved by the manufacturer and meets the requirements of the roofing system warranty.
- 5. Samples: Provide sample of each type of insulation proposed, approximately 6 x 6 inches in size.

B. Closeout Submittals:

- 1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements, and Section 01 78 00 - Closeout Submittals:
 - a. Operation and Maintenance Data: Operating, cleaning and maintenance recommendations

1.05 MOCKUP

- a. Basic owner requirements to maintain warranty.
- b. Recommended maintenance guidelines and maintenance schedule
 - A. The project scope includes a stand-alone mock-up assembly representative of the exterior envelope of the building, and includes the Work of this section and other components of the exterior envelope as described in Section 01 40 00 - Quality Requirements.
 - B. The pertinent contractors and subcontractors shall erect the Mock-Up assembly for review by the Architect and Owner, and all corrective actions and replacement of unsatisfactory work identified by the Architect completed by the Contractors and accepted as the standard for execution of the work and the materials proposed prior to commencement of the work on the building envelope.

- C. Schedule Submittals for products indicated to be used in the mock-up so in sufficient time to allow review prior to the scheduled erection of the mock-up. Allow time for resubmittal and review.
- D. Following acceptance of submittals for material components and selection of colors provide materials of each color selected, installed in place on the mock up for final review by Architect prior to proceeding with the Work.
 - 1. The mock-up shall be constructed full size as indicated in the Drawings, and utilize specified colors and materials.
 - 2. Demonstrate the anticipated range of materials, workmanship and finish expected.
 - 3. Accepted mock-ups will be used as standard of comparison for colors and textures of units, mortar, bond pattern, joint finish. joint reinforcement, anchors, ties, workmanship, and other pertinent details, including proposed method of keeping cavities free of mortar.
 - 4. Modify and/or replace mock-ups as many times as necessary to obtain Architect's and Owner's approval.
 - 5. Do not start work until mock-ups are accepted by Owner and Architect.
- E. Mock-up may not remain as part of the Work.

1.06 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation Under Concrete Slabs: Extruded polystyrene board.
- B. Insulation at Perimeter of Foundation: Extruded polystyrene board.
- C. Insulation Inside Masonry Cavity Walls: Mineral Fiber board.
- D. Insulation at exterior walls behind fiber cement, plastic, and other siding panels: Mineral fiber board.
- E. Insulation to fill flutes at underside of metal deck: Mineral fiber batt, cut to fit deck profile.
- F. Insulation at slab edges as smoke sealing or fire stopping: Mineral fiber batt.
- G. Insulation at curtainwall safing: Mineral board.
- H. Insulation Above Lay-In Acoustical Ceilings: Fiberglass batt insulation with no vapor retarder.
- I. Insulation Above Roof Deck: Polyisocyanurate board.
- J. Insulation at miscellaneous gaps and voids: as indicated on drawings, or one of the products specified herein as best suited to the field condition and code requirements.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: ASTM C 578, Type IV and Type VII: Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. R-value; 1 inch of material at 72 degrees F: 5, minimum.
 - 4. Board Size: to be coordinated with masonry veneer anchor spacing, and metal wall panel sub-girt spacing. Provide largest boards practical for other applications.
 - a. At concrete slabs and foundation walls with no veneer anchors or other penetrants: largest practical board size.
 - 5. Board thickness: as indicated on drawings.
 - 6. Board Edges: provide edges for each installation condition, as follows.
 - a. Tongue-and-groove at foundation wall and horizontal applications with no veneer anchors or other penetrants that would prevent tight fit of boards.

7. Thermal Resistance: R factor of 5 ft²• h•°F/Btu at 75 degrees F: R-value determined by ASTM C518.
 8. Compressive Resistance: 25 psi at vertical applications, 60 psi at horizontal applications under slabs and footings..
 9. Water Absorption, maximum: 0.3 percent, volume.
 10. Manufacturers:
 - a. Dow Chemical Co: www.dow.com.
 - b. Owens Corning Corp: www.owenscorning.com.
 - c. Kingspan Insulation LLC; GreenGuard XPS TYPE VI 40 PSI: www.trustgreenguard.com.
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.
- B. Polyisocyanurate Insulation for use in roofing system, shall meet requirements of UL1256 or FM4450; .
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 3. Polyisocyanurate insulation for use in single ply roof membrane system shall meet requirements of UL1256 or FM 4450.
 4. Insulation shall be a material approved by the manufacturer for use in warranted roofing system.
 5. Insulation shall be approved in writing by insulation manufacturer for intended use with specified membrane materials.
 6. Board Size: 48 x 96 inch where indicated to be mechanically attached and 48x48 inch where indicated to be adhered.
 7. Thermal Resistance: LTTR-value of 5.7 per inch of thickness.
 8. Board Edges: Square.
 9. Tapered Insulation: Provide tapered insulation and crickets as indicated on drawings (1/4"/12" min.).
 10. Manufacturers:
 - a. Atlas Roofing Corporation: www.atlasroofing.com.
 - b. Dow Chemical Co: www.dow.com.
 - c. GAF; www.gaf.com.
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.
- C. Cellular Glass Board Insulation: Cellular glass board with the following characteristics:
1. Smoke Developed Index: 0, when tested in accordance with ASTM E84.
 2. Board Size: 3.19 x 17.7 inch.
 3. Board Thickness: 2 inch.
 4. Board Edges: Square.
 5. Compressive Strength: Minimum 398 psi.
 6. Manufacturers: Pittsburgh Corning; Foamglas Cellular Insulation Guide; www.foamglas.com.

2.03 FIBER BOARD INSULATION MATERIALS

- A. Mineral Fiber Board Insulation: Rigid or semi-rigid mineral fiber, ASTM C612 or C553; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
 2. Thickness: As indicated on drawings or to meet UL assembly requirements.

3. Density: Minimum 11 lb/cu ft., for product behind metal panel and cementitious siding.
 - a. Thermal Resistance: Minimum R-value of 4.0.
4. Density: Minimum 6.0 lb/cu ft for product behind masonry veneer construction (dual density 6.2/ 4.1lb. is acceptable).
 - a. Thermal Resistance: Minimum R-value of 4.3.
5. Manufacturers: The Awarding Authority have voted to make this product a proprietary specification. Mineral wool Insulation behind masonry veneer construction may be manufactured by ether Roxul, Inc. or Thermafiber, Inc. Mineral wool insulation behind areas of metal wall panels or fiber cement siding may only be produced by Roxul Inc.

2.04 **BATT INSULATION MATERIALS**

- A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 4. Formaldehyde Content: Zero.
 5. Thickness: To fill width of stud cavities, or 3-1/2 inch if no thickness is indicated in the drawings for other applications.
 6. Facing: Aluminum foil, flame spread 25 rated; one side.
 7. Manufacturers:
 - a. CertainTeed Corporation: www.certainteed.com.
 - b. Johns Manville Corporation: www.jm.com.
 - c. Owens Corning Corp: www.owenscorning.com.
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.
- B. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
 1. Where indicated, provide foil facing on one side; with flame spread index of 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
 3. Manufacturers:
 - a. Thermafiber, Inc: www.thermafiber.com.
 - b. Rock Wool Manufacturing Company: www.deltainsulation.com.
 - c. Roxul. www.roxul.com.
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.

2.05 **ACCESSORIES**

- A. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- B. Adhesive: Type recommended by insulation manufacturer for application and substrate materials, and complying with applicable fire resistance requirements.
- C. Foam Glass Cellular Insulation Adhesive: PC 99; www.foamglas.com.

PART 3 EXECUTION

3.01 PREPARATION

- A. Comply with manufacturer's written installation instructions for preparing substrates.
- B. Coordinate schedule of installation with Owner to ensure building is not occupied during installation. Identify and block all fresh-air ventilation intakes into the building with plastic sheets to prevent fumes from entering the building.

3.02 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.03 INSTALLATION - GENERAL

- A. Insulation that is part of the roofing assembly shall be provided and installed by the Section 07 00 02 Roofing Flashing and Sheet Metal Trade Contractor.
- B. Insulation that is within exterior masonry veneer cavities or within other exterior wall systems including metal panel siding shall be provided and installed by the Section 04 00 01 Masonry Trade Contractor.
- C. Insulation installed below slab on grade construction shall be provided and installed by the Section 03 30 00 Cast in Place Concrete contractor.
- D. Acoustic batt insulation and acoustic spray insulation shall be provided and installed by the Section 09 21 16 Gypsum Board Assemblies contractor.
- E. Mineral Board insulation that is part of a firestopping or firesafing system shall be provided and installed by the Section 07 84 00 Firestopping contractor as part of the UL rated assembly.
- F. Install insulation in accordance with manufacturer's written application instructions, as per the Drawings and Specification.
- G. Install insulation as a contiguous envelope on all sides, including roofs, exterior walls and at grade; make airtight around each fenestration.
 - 1. Secure insulation in place to prevent shifting and discontinuity of the insulation envelope.
 - 2. Allow for material and building movement.
 - 3. Insulation thickness to uniformly achieve R-Value performance for each surface plane as called out by the Drawings, or where not called out, as specified.
- H. Install rigid insulating units with joints close and flush, in regular courses and with cross-joints overlapping.
 - 1. Align and space rigid insulation joints with building movement joints.
 - 2. Seal perimeter and around penetrations with compatible materials as recommended by manufacturer.
- I. Do not close-up wall cavities, pipe or other chases or conceal other work requiring inspection until inspections by AHJ have been successfully completed.

3.04 MINERAL FIBER INSTALLATION AT MISCELLANEOUS CONDITIONS

- A. Install insulation in accordance with manufacturer's instructions, as per the Drawings and Specification.
- B. Fill flutes at underside of metal decking as indicated on drawings with shapes factory-cut to profile to completely fill voids. Friction fit insulation into place, or use mechanical fasteners if configuration will not permit insulation to remain in place.
- C. Fill annular space at ductwork, pipe, and other wall penetrations in non-rated partitions where not exposed to view with insulation to full thickness of wall stud. Coordinate installation with mechanical ductwork installer to place materials before duct sleeve / covers are installed at the penetrations.
- D. Install insulation at firestopping assemblies in accordance with the requirements of Section 07 84 00 - Firestopping, and the UL requirements for the chosen assemblies.

- E. Install insulation at slab edge smoke sealing tightly fit between adjacent materials, leaving no voids or gaps that would allow the passage of smoke.
- F. Installation shall meet AHJ requirements and approval.

3.05 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions, as per the Drawings and Specification.
- B. Install in wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities with sufficient friction to hold material in place until wall board is installed.
- E. Fill stud cavities at partitions from floor to not less than 6 inches above the highest adjacent ceiling finish.
- F. Where indicated on drawings, install batt insulation on ceilings tightly fit to minimize gaps between sections. Do not lay insulation over or within 3 inches of recessed lighting fixtures.
- G. Coordinate work of this section with construction of VR/AIB specified in Section 07 25 00.

3.06 FIELD QUALITY CONTROL

- A. Field Tests and Inspections per SECTION 01 40 00, and as follows:
 - 1. Rigid Insulation will be reviewed by building commissioning agent and Architect for proper fit.
 - 2. Allow for quality control review in construction sequence so that materials are not concealed prior to evaluation.
- B. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items.
 - 1. Replace damaged materials or items with New if repair not acceptable to Architect.

3.10 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

3.11 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, or other causes.
 - 1. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, and installing the following work:
- B. Foamed-in-place insulation at miscellaneous conditions and locations, including but not limited to the following:
 - 1. To fill gaps at penetrations of exterior wall insulation.
 - 2. At junctions of dissimilar wall and roof materials.
 - 3. Complete coverage of all basement walls
 - 4. Complete coverage of all first floor walls
 - 5. Complete coverage to the underside of roof sheathing at sloped and flat roofs.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract General requirements of the Project Manual apply to this Subcontractor, material supplier, and other persons furnishing labor and materials under this section. General Conditions, Supplementary Conditions and applicable parts of Division 01 are included as part of this section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 03 30 00 - Cast-in-Place Concrete.
 - 2. Section 04 20 00 - Unit Masonry.
 - 3. Section 07 13 00 – Sheet Waterproofing.
 - 4. Section 07 21 00 - Thermal Insulation.
 - 5. Section 07 84 00 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.
 - 6. Section 07 90 05 - Joint Sealers.
 - 7. Section 08 11 13 - Hollow Metal Doors and Frames.
 - 8. Section 08 52 13 - Clad Wood Windows.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM:
 - a. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - b. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - c. ASTM C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
 - d. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics
 - e. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - f. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

- g. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- h. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- i. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
- B. Coordination per Section 01 31 14.

1.05 SUBMITTALS

- A. Construction Submittals
 - 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - 2. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.
 - 3. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.
- B. Closeout Submittals
 - 1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements, and Section 01 78 00 - Closeout Submittals, and as follows:
 - a. Operation and Maintenance Data: Operating, cleaning and maintenance recommendations.
 - 1) Basic owner requirements to maintain warranty.
 - 2) Recommended maintenance guidelines and maintenance schedule.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than ten years of documented experience.
- B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum five years of documented experience.
- C. Single Source Responsibility: Furnish SPF system materials from one manufacturer for entire Project, unless otherwise acceptable to Architect.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke limitations.

1.08 FIELD CONDITIONS

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.
- B. Refer to manufacturer's maximum wind speed requirements.
- C. Do not apply foam when temperature is within 5 F of dew point.
- D. Protection of the premises from damage: Protect against ignition of insulation materials at all times.
- E. Comply with fire ratings indicated for each wall system and as required by code for materials.
- F. Health and safety: There are odors and vapors related to field-applied urethane foams and sealants. While there is minimal danger from exposure to the vapors of this product during installation with normal venting, individuals with respiratory sensitivities should evacuate the premises while the work is being done.
 - 1. Protect areas where ventilation is adequate with signage and require personnel in the unvented area to wear proper breathing protection.
 - 2. Protect fresh air inlets and seal off, air-tight, any areas where air may transfer from work area to occupied areas. Coordinate with owner to develop an implementation plan.

PART 2 PRODUCTS

2.01 MATERIALS

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- A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 - 1. Aged Thermal Resistance (R-value): 6 (deg F hr sq ft)/Btu, minimum, when tested at 1 inch thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F.
 - 2. Water Vapor Permeance: Vapor retarder; 1 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
 - 3. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
 - 4. Air Permeance: 0.004 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.5 psf.
 - 5. Closed Cell Content: At least 90 percent.
 - 6. Air Permeance as tested per ASTM E 283: Less than 0.0001 Liters per sec per square meter.
 - 7. Compressive Strength: Min. 25 psi, when tested in accordance with ASTM D 1621.
 - 8. Density: Min. 2 pcf, when tested in accordance with ASTM D 1622.
 - 9. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
 - 10. Closed cell content: greater than 90 percent.
 - 11. Products:
 - a. Demilec (USA) LLC; HEATLOK SOY 200: www.demilecusa.com.
 - b. Icynene Inc; MD-C-200: www.icynene.com.
 - c. BASF; Walltight: www.basf.us.
 - d. NCFI; Insubloc: www.ncif.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Miscellaneous Air Sealing Materials: Provide caulking with approved caulking compound at all locations requiring air infiltration sealing that are too small (3/16 inch or less) for foam sealants.

2.02 ACCESSORIES

- A. Primer: As required by insulation manufacturer.
- B. Overcoat: Cementitious type, spray applied; flame spread index of 25 and smoke developed index of 100, when tested in accordance with ASTM E84.
 - 1. Basis-of-Design Manufacturer / Product: Specialty Products Inc. / FlameSeal-TB, or an Architect acceptable equivalent products subject to compliance with requirements from one of the following manufacturers:
 - a. Flame Control Coatings / Foam Kote 50-50A.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Apply to a minimum cured thickness of 3" min or as indicated on on drawings. inch.
- D. Patch damaged areas.
- E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
- F. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 FIELD QUALITY CONTROL

- A. Field inspections and tests will be performed by an independent testing agency under provisions of Section 01 40 00.
- B. Inspection will include verification of insulation and overcoat thickness and density.

3.05 PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 25 00

WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vapor Retarders/ Air Infiltration Barrier (VR/AIB): Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor-resistant and air tight.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract General requirements of the Project Manual apply to this Contractor, material supplier, and other persons furnishing labor and materials under this section. The General Conditions, Supplementary Conditions and applicable parts of Division 01 are included as part of this section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 06 10 00 - Rough Carpentry: blocking at window openings and other locations in contact with VR/AIB.
 - 2. Section 07 21 00 - Thermal Insulation: Building insulation installed over VR/AIB.
 - 3. Section 07 90 05 - Joint Sealers: Sealant materials and installation techniques.
 - 4. Section 08 11 13 - Hollow Metal Doors and Frames.
 - 5. Section 08 52 13 - Clad Wood Windows.
 - 6. Section 09 21 16 - Gypsum Board Assemblies: Substrate sheathing to receive VR/AIB.

1.03 DEFINITIONS

- A. VR/AIB (Vapor Retarder/ Air Infiltration Barrier): Air tight barrier made of material that is also water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent air barrier system components.
- B. Air Barrier System: The complete and continuous system of components, properly connected, to make an air tight barrier around the building.
- C. Air Barrier System Component: Components of the Air barrier system are the VR/AIB, windows, doors, louvers, curtain wall systems and approved flashings and tapes.
- D. Water Vapor Permeance: For purposes of conversion, $57.2 \text{ ng}/(\text{Pa s sq m}) = 1 \text{ perm}$.

1.04 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. American Association of Textile Chemists and Colorists:
 - a. AATCC Test Method 30 - Antifungal Activity, Assessment on Textile Materials: Mildew and Rot Resistance of Textile Materials.
 - b. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test.
 - 2. ASTM - ASTM International:
 - a. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 - b. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
 - c. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - d. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

- e. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
 - f. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
3. ICC - International Code Council:
- a. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc..
 - b. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; ICC Evaluation Service, Inc..
 - c. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc..

1.05 REGULATORY REQUIREMENTS

- A. The Work of this Section is intended to create a continuous air barrier to control leakage into or out of the building, in accordance with Section 502.4.3 of the MSBC. These requirements include the following:
- 1. Materials used shall have an air permeance not to exceed 0.004 cfm/ sq. ft. under a pressure differential of 0.3 in. water column (1.57 psf) (75Pa) when tested in accordance with ASTM E 2178 and shall be taped or sealed in accordance with the manufacturer's instructions.
 - 2. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
 - 3. Barrier materials shall be maintainable, or, if inaccessible, shall meet durability requirements for the service life of the envelope assembly. The air barrier material of an envelope assembly shall be joined and sealed in a flexible manner to the air barrier material of adjacent assemblies, to allow for the relative movement of assemblies due to thermal and moisture variations and creep. Connection shall be made between:
 - a. Basement slab
 - b. Walls and windows or doors.
 - c. Different wall systems.
 - d. Wall and roof.
 - e. Wall and roof over unconditioned space.
 - f. Walls, floor and roof across construction, control and expansion joints.
 - g. Walls, floors and roof to utility, pipe and duct penetrations.

1.06 SUBMITTALS

- A. Construction Submittals:
- 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - 2. Product Data: Provide data on material characteristics.
 - 3. Manufacturer's Installation Instructions: Indicate preparation.
 - 4. Subcontractor's written acknowledgement of acceptance of substrate conditions as acceptable to receive products of this section. Submit prior to commencement of installation of products of this section.
 - 5. VR/AIB adhesion test results identified in Paragraph 3.04 of this section. Submit within 48 hours of completion of testing for informational purposes.
- B. Closeout Submittals:
- 1. Submittal Procedures per Section 01 78 00, and as follows:
 - a. Warranty Documentation: Executed warranties.

1.07 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before,

during and after installation.

PART 2 PRODUCTS

2.01 VAPOR RETARDER/ AIR INFILTRATION BARRIER (VR/AIB)

- A. At contractor's option, provide fluid applied, or self-adhering sheet VR/AIB products meeting the following performance criteria:
 - 1. Material meets the following State of Massachusetts Building Code requirements as an Air Barrier.
 - 2. Material shall have vapor permeability rating of less than 1.0.
 - 3. Material shall be capable of satisfying the building interface and joint conditions shown in drawings, and spanning said joints to make connection to air barrier components being installed by other subcontractors, including foundation dampproofing, and roof vapor retarder using.
 - 4. Material shall be compatible with dampproofing, roof vapor retarder, and insulation boards.

2.02 MANUFACTURERS / PRODUCTS

- A. Subject to meeting requirements of this section; provide products from one of the following.
 - 1. Carlisle; product Fire-Resist Barritech NP; fluid applied Class II vapor retarder / air barrier.
 - 2. Henry Company; product Air Bloc 32 MR fluid applied.
 - 3. Sto Company; product StoGuard with VaporSeal A1000V fluid applied.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Performance requirements.
 - 1. Air Permeance: <0.004CFM/SQ.FT.
 - 2. Water Vapor Permeance: <0.1 Perm when tested in accordance with ASTM E96.
 - 3. Elongation: 500% min. when tested in accordance with ASTM D412 or D413.
 - 4. Solids Content: 54% min.
 - 5. Pulloff Adhesion: Not less than 30 PSI on Masonry substrate, or greater than adhesion of facing layer on sheathing when tested in accordance with ASTM D4541.
 - 6. Class A Rated: Smoke Developed Index less than 425, flamespread index less than 450.

2.03 ACCESSORIES

- A. Sealants:
 - 1. Sealants and sealant Backers: As specified in Section 07 90 05; products compatible with VR/AIB materials and recommended by the manufacturer.
 - 2. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.
 - a. included as part of NFPA285 tested assembly.
- B. Adhesives:
 - 1. Mastic Adhesive : Compatible with sheet seal and substrate as recommended by manufacturer for the VR/AIB system, thick mastic of uniform knife grade consistency.
 - 2. Non-Curing Adhesive : Compatible with sheet seal and substrate, permanently non-curing.
- C. Flexible Flashing - VR/AIB "Transition Tape": Self-adhesive sheet flashing complying with ASTM D1970, except slip resistance requirement is waived if not installed on a roof. Products as recommended by manufacturer for compatibility with VR/AIB and documented as compatible with bituminous dampproofing, roof vapor retarder and wall insulation.
 - 1. Compatible as part of the NFPA 285 assembly featuring the selected VR/AIB.
- D. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.
- B. Identify substrate conditions that are unacceptable for application of materials of this section to the General Contractor prior to commencing with work of this section. Do not apply materials until unacceptable conditions are resolved.
- C. Submit written acceptance of substrate conditions prior to commencing with installation of the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instruction.
- B. All penetrations of the VR/AIB and paths of infiltration and exfiltration shall be made air tight. Seal seams and joints to adjacent surfaces with compatible transition materials.
- C. Provide full support of VR/AIB.
- D. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
- E. Self-Adhesive Sheets:
 - 1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
 - 2. Lap sheets shingle-fashion to shed water and seal laps air tight.
 - 3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that all laps are firmly adhered with no gaps or fishmouths.
 - 4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
 - 5. At wide joints, provide extra flexible membrane allowing joint movement.
- F. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
 - 2. Where exterior masonry veneer is to be installed, verify that masonry anchors are installed before installing weather barrier over masonry; seal around anchors air tight.
 - 3. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch; use sheet seal to join to adjacent construction, seal air tight with sealant.
 - 4. Use flashing to seal to adjacent construction and to bridge joints.
- G. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
 - 3. At head of openings, install weather barrier beneath and over flashing in layers arranged to provide positive drainage, extending at least 4 inches beyond face of jambs; seal weather barrier to flashing.
 - 4. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

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- A. Do not cover installed weather barriers until required inspections have been completed.
- B. Conduct pull-adhesion tests of installed self-adhesive Vapor Retarder / Air Infiltration Barrier (VR/AIB) in accordance with ASTM D4541. Perform a minimum of three tests per day with a minimum of one test on each substrate surface to which materials are applied on that day. identify specific location of tested VR/AIB product. Submit each report within 48 hours of completion of tests.
 - 1. Remove and reapply, or repair materials that do not meet manufacturer's stated adhesion properties in a manner acceptable to the manufacturer and/or stated in the specifications.
- C. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- D. Take digital photographs of each portion of the installation prior to covering up.

3.05 **PROTECTION**

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 31 13 ASPHALT SHINGLES

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this Section shall be included in the Roofing and Flashing Filed Sub-Bid. Refer to Section 07 00 02: Roofing and Flashing Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following work, as indicated in the drawings and specified herein:
 1. Asphalt shingle roofing.
 2. Flexible sheet membranes for eave protection, underlayment, and valley protection.
 3. Rigid Insulation.
 4. Vapor Retarder / Air Barrier (VR).
 5. Associated metal flashings and accessories.
 6. Crickets.
 7. Accessories as needed for a complete installation.

1.03 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 1. Section 06 10 00 - Rough Carpentry: Blocking and nailers at roof.
 2. Section 07 21 00 - Thermal Insulation: Rigid insulation board.
 3. Section 07 62 00 - Sheet Metal Flashing and Trim.
 4. Section 07 72 00 - Roof Accessories.
 5. Section 07 21 19 - Foamed-In-Place Insulation.
 6. Division 22 Plumbing Sections: vents through roof requiring flashing.

1.04 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 1. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 2. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method).
 3. ASTM D3462/D3642M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules.
 4. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 5. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
 6. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.

7. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments.
8. NRCA - The NRCA Steep Roofing Manual; National Roofing Contractors Association; 2009 Edition, with interim updates.
9. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.
10. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc..

1.05 SUBMITTALS

A. Construction Submittals

1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
2. Product Data: Provide data indicating material characteristics.
3. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.
4. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
5. Subcontractor's written acceptance of substrate conditions. Submit prior to commencing with work of this section.
6. Manufacturer's field inspection reports of installation. Submit within five days of field inspection.

B. Closeout Submittals

1. Submittal Procedures: Section 01 78 00.
 - a. Warranty Documentation: Executed warranties
 - b. Basic Owner maintenance guidelines and maintenance schedule and other requirements to maintain warranty.
2. At Project Completion: Roofing manufacturer's technical representative shall inspect the roof and provide copy of report to Architect and Owner.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:

1. Timing: The meeting shall take place ideally prior to the start of the roofing installation, but no more than 2 weeks into the roofing project.
2. Attendees: Meeting's mandatory attendees shall include the certified contractor and the manufacturer's representative, Owner's representative, Architect and the general contractor's representative.
3. Topics: Certified contractor and manufacturer's representative shall review all pertinent requirements for the project, including but not limited to, scheduling, weather considerations, project duration, and requirements for the specified warranty. General Contractor shall review quality control and specific detail conditions, as well as coordination with other trades.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with the recommendations of NRCA Steep Roofing Manual and manufacturer's instructions.
- B. Building Envelope Commissioning will be provided for this project by the Owner. This subcontractor shall cooperate fully with the Building Commissioning Agent to provide access for testing of installed materials, and to repair or remediate conditions identified by the Building Commissioning Agent in order to obtain his acceptance of installed work.
- C. Products Required to Comply with Fire Resistance Criteria: UL listed and labeled.

1.08 MOCK-UP

- A. The project scope includes a stand-alone mock-up assembly representative of the exterior envelope of the building, and includes the Work of this section and other components of the

exterior envelope as described in Section 01 40 00 - Quality Requirements.

- B. The Mock-up assembly shall be constructed, observed, and all corrective actions required by the Architect or Owner shall be completed and mock-up accepted prior to commencing work of building envelope.
- C. Schedule Submittals for products indicated to be used in the mock-up so in sufficient time to allow review prior to the scheduled erection of the mock-up. Allow time for resubmittal and review.
- D. Following acceptance of submittals for material components and selection of colors provide materials of each color selected, installed in place on the mock up for final review by Architect prior to proceeding with the Work.
 - 1. The mock-up shall be constructed full size as indicated in the Drawings, and utilize specified colors and materials.
 - 2. Demonstrate the anticipated range of materials, workmanship and finish expected.
 - 3. Accepted mock-ups shall be used as standard of comparison for colors and textures of units, mortar, bond pattern, joint finish, joint reinforcement, anchors, ties, workmanship, and other pertinent details, including proposed method of keeping cavities free of mortar.
 - 4. Modify and/or replace mock-ups as many times as necessary to obtain Architect's and Owner's approval.
 - 5. Do not start work until mock-ups are accepted by Owner and Architect.
- E. Locate where directed by Architect.
- F. Approved Mockup may not remain as part of the Work.

1.09 **FIELD CONDITIONS**

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements, and as follows:
 - 1. Weather Conditions: No rain, fog and/or frost, and none in the immediate forecast.
- B. Work Conditions:
 - 1. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Care should be exercised to provide protection for the interior of the building and to ensure water does not flow beneath any completed sections of the membrane system.
 - 2. Only as much of the new roofing as can be made weather-tight each day, including all flashing, insulation, roof board, and detail work, shall be installed. Insulation and roof board must be covered by roofing same day as laid. Roof shall be cleaned and made watertight before leaving the job site that day.
 - 3. All Work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The building and its contents shall be protected against all risks. Avoid over-use of non-vented direct-fired heaters during winter months. Avoid application of roof board during rains, heavy fogs and other conditions that may deposit moisture on the surface.
 - 4. All surfaces to receive new insulation, membrane, metal roof deck, roofing material of any type, or flashings shall be dry. Should surface moisture occur the Applicator shall provide the necessary equipment to dry the surface prior to application.
 - 5. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.
 - 6. Uninterrupted water-stops shall be installed at the end of each day's work and shall be completely removed before proceeding with the next day's work. Water-stops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses. Contaminated roofing shall be replaced at no cost to the Owner.
 - 7. Arrange work sequence to avoid use of newly constructed roofing as a walking surface

or for equipment movement and storage. Where such access is absolutely required, the Applicator and barriers to segregate the work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over felt or plywood over insulation board shall be provided for all roof areas to receive rooftop traffic during construction.

8. Prior to and during application, all dirt, debris and dust shall be removed from surfaces by vacuuming, sweeping, blowing with compressed air and/or similar methods.
9. All rooftop contamination that is anticipated or that is occurring shall be reported to the manufacturer to determine the corrective steps to be taken.
10. Applicator shall verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Applicator shall report any such blockages in writing to the Owner's Representative for corrective action prior to installation of the roof system.
11. Applicator shall immediately stop work if any unusual or concealed condition is discovered and shall immediately notify GC of such condition in writing.
12. Site cleanup, including both interior and exterior building areas that have been affected by construction, shall be completed to the Owner's satisfaction.
13. All landscaped areas damaged by construction activities shall be repaired at no cost to the Owner.
14. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Keep lids on unused cans at all times.
15. Applicator shall follow all safety regulations as required by OSHA and other AHJ.
 - a. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

1.10 WARRANTY

- A. Warranties: Prepare and submit in accordance with Section 01 78 00 - Closeout Submittals.
 1. Asphalt Shingle Roof System Manufacturer Warranties:
 - a. Shingle manufacturer shall provide a 40 year material with a 20 year non-prorated warranty and 20 year misapplication warranty against manufacturing defects issued upon completion of the work and beginning on the date of Substantial Completion
 - b. Manufacturer's warranty of the Asphalt Shingle Roof System (including shingles and related materials when products of the shingle manufacturer, including but not limited to underlayment, ice and water shield, and ridge vent) shall be non-prorated and cover materials, labor and workmanship, including tear-off and disposal costs for the first 15 years.
 - c. Shingle manufacturer's warranty against blow-offs for up to 105 mph.
 2. Manufacturer's standard warranties on rigid insulation, vented insulation, and other materials not manufactured by the Asphalt Shingle Manufacturer.
 3. Roofer's Workmanship Warranty:
 - a. Roofer shall provide a separate three year warranty of the Asphalt Shingle Roof System.
 - 1) In the event any work related to roofing, flashing, or metal is found to be defective, installed improperly or otherwise not in accordance with the Contract Documents within this warranty term, Contractor shall repair that defect at no cost to the Owner.
 - b. Warranty obligation shall run directly to the Owner, and a copy shall be sent to the manufacturer and Architect.

PART 2 PRODUCTS

2.01 SHINGLES

- A. Manufacturers:
 1. Basis of design: GAF/ Elk Materials Corporation; Product Timberline Lifetime High Definition Shingles: www.gaf.com.

- a. Heavyweight, granule surfaced, self sealing asphalt shingle with a fiberglass reinforced core and a mineral granule surfacing. Architectural laminate styling with a wood shake appearance with a 5-1/2 inch exposure.
 - b. Rated by the Cool Roof Rating Council (CRRC) with an SRI of 29 or greater.
 - c. UL 790 Class A rated with UL 997 Wind Resistance Label.
 - d. ASTM D 7158, Class H.
 - e. ASTM D 3161, Type 1; A.
 - f. STM D 3018, Type 1.
 - g. ASTM D 3462.
 - h. ICC Report Approval, Title 24 compliant and Energy Star compliant.
 - i. Color: Oyster Grey.
 - j. Provide matching self-sealing ridge cap shingles by same manufacturer as general roof shingles. For ridge cap shingles, follow manufacturer's instructions for double thickness offset.
2. Owens Corning Corp Duration Premium Cool Shingles: www.owenscorning.com.
 3. Certainteed Landmark Solaris, Solaris Gold or Solaris Platinum Shingles.
 4. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.

2.02 UNDERLAYMENTS

- A. Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.
 1. Manufacturers:
 - a. Same manufacturer as asphalt shingles; protection membrane shall be part of a roofing assembly providing the stated warranty.
- B. Water Barrier Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
 1. Type: UV stabilized polypropylene non-asphaltic underlayment.
 2. Minimum Requirements: Comply with requirements of ICC-ES AC207 for non-self-adhesive sheet.
 3. Ultraviolet Resistance and Weatherability: Approved in writing by manufacturer for exposure to weather for minimum of 6 months.
 4. Water Vapor Permeance: Vapor permeable; minimum of 10 perms, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
 5. Performance: Meet or exceed requirements for ASTM D226/D226M, Type II asphalt-saturated organic felt.
 6. Liquid Water Transmission: Passes ASTM D4869.
 7. Fasteners: As specified by manufacturer and building code qualification report or approval, if any.
 8. Manufacturers:
 - a. Same manufacturer as asphalt shingles; protection membrane shall be part of a roofing assembly providing the stated warranty.

2.03 VAPOR RETARDER / AIR BARRIER (ROOF VR/AIB)

- A. Vapor Retarder: Complying with requirements of fire rating classification; compatible with roofing and insulation materials, self-adhering membrane with adhesive laminated to nonwoven fabric,

fabricated specifically for the intended purpose.

1. Product meeting air barrier requirements of building code as an air barrier, less than 0.004 cfm per square foot at 1.57 psf air permeance when tested in accordance with ASTM E2178.
 - a. Products:
 - 1) Carlisle Syn Tec: 725 TR.
 - 2) Firestone Building Products: V Force vapor barrier membrane.
 - 3) Versico Inc.: 725.
 - 4) Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.
2. Provide all accessories required by manufacturer for substrate conditions and for a complete installation, including lap sealants, primers, and adhesives.

2.04 ACCESSORIES

- A. Nails: 10-12 gauge ring shank, hot-dipped galvanized roofing nails meeting ASTM-A153 with 3/8" to 7/16" heads. Note: If nailguns are used, provide hot-dipped galvanized nails in coils specifically for use with nailguns. Electrogalvanized nails and staples are not permitted.
- B. Flashing for Plumbing vent extensions:
 1. Plastic or rubber boot or approved equal.
- C. Cement: Type recommended by shingle manufacturer. Plastic asphalt cement, lap cement, or quick setting adhesive cement.
- D. Crickets: Provide crickets at high side of all roof-top equipment and/or curbs, penetrations; prefabricated or custom constructed to meet Project conditions.
- E. Concealed Fasteners for vented nailboard, insulation at related materials: Type, size and length as recommended by the manufacturer to meet Project conditions.
- F. Exposed Fasteners: Shall be Type 304 stainless steel. Type, size and length as recommended by the manufacturer to meet Project conditions.
- G. Nails: Standard round wire shingle type, of hot-dipped zinc coated steel, 12 gage, 0.105 inch shank diameter, 3/8 inch head diameter, of sufficient length to penetrate through roof sheathing or 3/4 inch into roof sheathing or decking.

2.05 METAL FLASHINGS & TRIM

- A. Metal Flashings: Provide sheet metal eave edge, gable edge, and other flashing indicated.
 1. Provide flashings and fascia trim per the product and installation requirements in Section 07 62 00 - Sheet Metal Flashing and Trim.
 2. Form flashings to protect roofing materials from physical damage and shed water.
 3. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
 4. Hem exposed edges of flashings minimum 1/4 inch on underside.
 5. Separate all metal flashings and trim from pressure treated wood blocking or nailers with 30 lb. felt paper, red rosin paper, or VR/AIB material.
- B. The requirements of 07 62 00 apply to this section.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify conditions prior to beginning work.
- B. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

- C. Verify roof openings are correctly framed.
- D. Verify deck surfaces are dry, free of ridges, warps, or voids.
- E. Identify any unsuitable substrate surfaces or conditions to the General Contractor prior to commencing with work of this section.
- F. Submit written acceptance of substrate surfaces and conditions prior to commencing with work of this section.

3.02 INSTALLATION - GENERAL

- A. Arrange for roofing system manufacturer's technical representative to visit site and observe installation of the work of this section. The number of visits shall be based upon the roofing manufacturer's warranty requirements, but shall in no case be less than one visit during the progression of the work, and one visit upon completion of the work of this section. Submit copies of manufacturer's written field reports.

3.03 INSTALLATION OF FIRE RESISTANT DECK SHEATHING

- A. Install deck sheathing on metal deck:
 - 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 - 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
- B. Mechanically fasten sheathing to roof deck, in accordance with roofing manufacturer's instructions.

3.04 INSTALLATION - EAVE PROTECTION MEMBRANE

- A. Install eave protection membrane in accordance with shingle manufacturer's roofing system warranty requirements, including but not limited to the following locations:
 - 1. From eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.
 - 2. At rake edges of roof, minimum 3 ft wide.
 - 3. At valleys, minimum 36 inches wide centered on valley.
 - 4. At roof penetrations, minimum 12 inches wide around penetration, or per the roofing system warranty requirements.
 - 5. At vertical walls above roofs, extend minimum 8 inches up wall, and minimum 12 inches on to the roof surface.
 - 6. At hips and ridges, centered on ridge. Do not block ridge vents.
 - 7. At other locations required by the roofing system warranty stated.
- B. Install protection membrane in accordance with manufacturer's instructions.
- C. Install only over a clean, dry deck.

3.05 INSTALLATION OF VAPOR RETARDER AND AIR INFILTRATION BARRIER

- A. The vapor retarder shall be laid directly over the fire resistive deck sheathing with all side and end joints sealed in accordance with the manufacturer's instructions.
- B. VR shall be sealed at each penetration and termination.
- C. VR shall extend to form a continuous seal with adjacent wall vapor retarder/air infiltration barrier (VR/AIB): seal at connection air/water tight.
 - 1. Coordinate with the Section 07 25 00 Weather Barrier subcontractor to assure that continuous seal is provided between roof VR/AIB provided by this section and VR/AIB at walls provided by that section.
 - 2. Installation shall be air and vapor tight to meet Building Code and Energy Code requirements.
 - 3. Extend vapor retarder under cant strips and blocking to deck edge.
 - 4. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

3.06 INSULATION INSTALLATION

- A. General. Install according to insulation manufacturer's instructions and recommendations meeting

requirements, and as follows:

1. Install insulation over the substrate with boards butted together. Fill joints or gaps greater than 1/4 inch with manufacturer's recommended sealant.
 2. Install multiple layers of insulation under area of roofing to achieve required thickness.
 - a. Cut and fit insulation within 1/4 inch (6mm) of nailers, projections, and penetrations.
 3. Attachment of Insulation: Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions. Use mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - a. Fasten insulation at intervals to resist uplift pressure at corners, perimeter, and field of roof.
 4. On metal deck, place boards perpendicular to flutes with insulation board edges bearing on deck flutes.
 5. Coordinate depth of roof insulation system installation with wood blocking work provided under Section 06 10 00.
 - a. Preservative treated wood nailers shall be installed at the perimeter of the entire roof and around such other roof projections and penetrations as specified on drawings.
 - b. Height of nailers shall be matched to that of the insulation thickness being used.
- B. Do not apply more insulation than can be covered in same day.

3.07 **INSTALLATION - INSULATION AND VENTILATED SHEATHING**

A. Insulation Application:

1. Obtain a copy of rigid insulation and ventilated sheathing installation guides from the manufacturers.
2. Blocking equal to the thickness of the rigid insulation and ventilated sheathing rigid insulation flush with the bottom face of vented channel shall be installed along the rake edge (See Architectural drawing and details in vented rigid insulation Installation Guide for eave wood blocking details).
3. Rigid insulation shall be positioned over fire resistant deck sheathing and structural deck with the long dimension perpendicular to the eave. Secure to roof deck with factory mutual approved fasteners/ plates. Use fastening pattern that meets factory mutual requirements.
4. Ventilating sheathing rigid insulation should then be positioned over the rigid insulation with the long dimension parallel to the eave and cross vent aligned with each other so as to provide continuous ventilating paths from eave to ridge. The vented rigid insulation panel then is secured to the roof deck with Factory Mutual approved fasteners/plates. Provide fastening pattern as recommended by manufacturer.

3.08 **INSTALLATION - UNDERLAYMENT**

- A. Install underlayment on low slope asphalt shingle roofs (up to 4:12) in conformance with building code requirements; provide half lap of membrane such that the entire roof surface is covered with 100% of two full layers of underlayment.
- B. Install underlayment on steep slope asphalt shingle roofs (4:12 and steeper) provide minimum four inches overlap at ends and edges of membrane such that the entire roof surface is covered with 100% of one full layer of underlayment.
- C. Items projecting through or mounted on roof: Weather lap and seal watertight with plastic cement.

3.09 **INSTALLATION - VALLEY PROTECTION**

- A. Install one layer of sheet metal flashing, minimum 24 inches wide, centered over open valley. Weather lap joints minimum 2 inch wide band of lap cement along each edge of first, and nail in place minimum 18 inches on center, 1 inch from edges. Seal all fasteners before application of overlying materials.

3.10 **INSTALLATION - SHINGLES**

- A. Install shingles in accordance with manufacturer's instructions.
 - 1. Fasten individual shingles using 2 nails per shingle, or as required by code, whichever is greater.
 - 2. Fasten strip shingles using 4 nails per strip, or as required by code, whichever is greater.
- B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area. Provide double course of shingles at eaves.
- C. Starter Strip:
 - 1. Project first course of shingles 3/4 inch beyond fascia boards.
 - 2. Apply row of inverted shingles or a nine inch wide starter strip of mineral surfaced roofing along lower eave edge, tabs facing up roof.
 - 3. Nail three inch in from eave edge, nail heads not exposed to first course cutouts.
- D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
- E. Cap hips with individual shingles, maintaining 5 inch weather exposure. Place to avoid exposed nails.
- F. Drip Edge:
 - 1. Set in flashing cement, and nail at three inch intervals.
- G. Weave shingles into each other at valleys per manufacturer's installation and warranty requirements.
- H. Coordinate all sheet metal work with laying of roof shingles
- I. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.
- J. Complete installation to provide weather tight service.

3.11 **CLEANING AND PROTECTION**

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
- B. Replace damaged shingles.
- C. Turn over to Owner any remaining bundles of shingles, but not less than the specified quantity of maintenance materials.
- D. Remove excess shingles not part of extra stock, and debris from project site.
- E. Leave work clean and free of stains, scrap and debris.
- F. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 46 46

FIBER CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiber cement horizontal siding.
- B. Horizontal soffits

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract General requirements of the Project Manual apply to this Subcontractor, material supplier, and other persons furnishing labor and materials under this section. General Conditions, Supplementary Conditions and applicable parts of Division 01 are included as part of this section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 04 20 00 - Unit Masonry.
 - 2. Section 06 10 00 - Rough Carpentry: Siding substrate.
 - 3. Section 07 21 00 - Thermal Insulation.
 - 4. Section 07 25 00 - Weather Barriers: Weather barrier under siding.
 - 5. Section 07 90 05 - Joint Sealers.
 - 6. Section 08 10 00 - Doors and Frames.
 - 7. Section 09 21 16 - Gypsum Board Assemblies: Siding substrate.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 3. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Construction Submittals
 - 1. Product Data: Manufacturer's data sheets on each product to be used, including:
 - a. Manufacturer's requirements for related materials to be installed.
 - b. Preparation instructions and recommendations.
 - c. Storage and handling requirements and recommendations.
 - d. Installation methods, including nail patterns.
 - 2. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).
 - 3. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
 - 4. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.

5. Submit shop drawings show all elevations to receive siding with dimensions. Show exposure to scale on drawings. Include a detail for each specific condition including, but not limited to: top of siding, base of siding, edge of siding at windows and doors, inside and outside corners, and connection to adjacent materials at a scale that is easy to read and understand. Details shall indicate type, size, and spacing of all fasteners, plank thickness, and finish. Show all joints and weatherproofing.
 6. Submit samples of each product specified including planks, trim, fasteners, rain screen flashing, and all other accessories.
- C. Closeout Submittals
1. Submittal Procedures per Section 01 78 00, and as follows:
 - a. Warranty Documentation: Executed warranties.
 - b. Operation and Maintenance Data: Operating, cleaning and maintenance recommendations.
 - 1) Basic owner requirements to maintain warranty
 - 2) Recommended maintenance guidelines and maintenance schedule.

1.05 **MOCK-UP**

The project scope includes a stand-alone mock-up assembly representative of the exterior envelope of the building, and includes the Work of this section and other components of the exterior envelope as described in Section 01 40 00 - Quality Requirements.

Schedule Submittals for products indicated to be used in the mock-up so in sufficient time to allow review prior to the scheduled erection of the mock-up. Allow time for resubmittal and review.

Following acceptance of submittals for material components and selection of colors provide materials of each color selected, installed in place on the mock up for final review by Architect prior to proceeding with the Work.

The mock-up shall be constructed full size as indicated in the Drawings, and utilize specified colors and materials.

Demonstrate the anticipated range of materials, workmanship and finish expected.

Accepted mock-ups will be used as standard of comparison for colors and textures of units, mortar, bond pattern, joint finish, joint reinforcement, anchors, ties, workmanship, and other pertinent details, including proposed method of keeping cavities free of mortar.

Modify and/or replace mock-ups as many times as necessary to obtain Architect's and Owner's approval. Do not start work until mock-ups are accepted by Owner and Architect.

1.06 **QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 5 of experience. The installer must list five similar projects prior to commencement of work. This list shall include project name, location, scope and Architect.
- B. Building Envelope Commissioning will be provided for this project by the Owner. This subcontractor shall cooperate fully with the Building Commissioning Agent to provide access for testing of installed materials, and to repair or remediate conditions identified by the Building Commissioning Agent in order to obtain his acceptance of installed work.

1.07 **DELIVERY, STORAGE, AND HANDLING**

- A. Store products under waterproof cover and elevated above grade, on a flat surface.

PART 2 PRODUCTS

2.01 **SIDING**

- A. Fiberglass Cement Siding -Type 1 (FC Siding Type-1): Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.

1. Style: Standard 4" lap exposure.
 2. Texture: Smooth.
 3. Length: 12 ft, nominal.
 4. Width (Height): 5-1/4 inches.
 5. Thickness: 5/16 inch, nominal.
 6. Finish: Factory applied topcoat. Shall be prefinished with factory applied prime plus sealer and factory finish paint on all surfaces per Manufacturer's recommendations.
 7. Color: To be selected by Architect from manufacturers full range of available colors.
 8. Manufacturer Warranty: 30 year limited; transferable.
 - a. 15 year paint finish Warranty.
 9. Installer Warranty: Upon Completion provide signed written warranty against defective workmanship and materials for a period of two (2) years from substantial completion date.
 10. Lap Siding Manufacturers:
 - a. CertainTeed Corporation : www.certainteed.com.
 - b. Basis of Design: James Hardie Building Products, Inc : www.jameshardie.com.
 - c. Nichiha USA, Inc : www.nichiha.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fiberglass Cement Siding Type 3 Shingle 5" to weather.
- C. Fiberglass Cement Siding Type-2 (FC Siding-T2): Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.
1. Style: Panel Siding with battens
 2. Texture: Smooth.
 3. Length (Height): 96 inches, nominal.
 4. Width: 16 and 2 1/2 inches and as indicated on drawings
 5. Thickness: 5/16 inch, nominal.
 6. Finish: Factory applied topcoat.
 7. Color: To be selected by Architect from manufacturers full range of available colors.
 8. Warranty: 30 year limited; transferable.
 9. Batten Boards:
 - a. Individual board made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.
 - 1) Texture: Smooth
 - 2) Length: 12 ft, nominal
 - 3) Width: 2 1/2 inches
 - 4) Thickness: 3/4 inches
 - 5) Finish: Factory applied topcoat.
 10. Manufacturers:
 - a. CertainTeed Corporation : www.certainteed.com.
 - b. Basis of Design: James Hardie Building Products, Inc : www.jameshardie.com.
 - c. Nichiha USA, Inc : www.nichiha.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

- A. Furring Strips: Galvanized metal channels.
- B. Fiberglass Cement Trim (FC-Trim): Same material and texture as siding.
 - 1. James Hardie Building Products, Harditrim planks, 5/4" NT3 Trim Smooth, or approved equivalent. Finish: Prefinished with factory applied Primeplus sealer and primer on all surfaces.
 - 2. Wood Trim: where cement-fiber trim cannot be used due to size limitations, use wood trim primed on all sides: plain-sawn birch, natural, selects. Kiln dried to average moisture content of 7% at time of installation.
- C. Color-1: To be selected by Architect from manufacturer's full range.
- D. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.
 - 1. Electro galvanized nails and staples are not permitted.
 - 2. Fasteners shall fit snug against siding (no air space). Do not over drive nail heads or drive nails at an angle.
- E. Joint Sealer: As specified in Section 07 90 05.
- F. ALUMINUM FLASHING TAPE: Polyken Foilastic 626-35 Flashing Tape or approved equivalent. This is a peel and stick, aluminum flashing tape, with butyl rubber adhesive. Select from 6", 9", or 12" widths as required by project conditions. www.tycoadhesives.com
- G. Siding Manufacturer, color-match exterior caulking or approved equivalent.
- H. Siding manufacturer, touch-up painting kits.
- I. Aluminum Flashing at all window and door heads

PART 3 EXECUTION

3.01 PREPARATION

- A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Verify that water-resistive barrier has been installed over substrate completely and correctly.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is the responsibility of another installer, notify General Contractor of unsatisfactory preparation before proceeding.
- E. Install sheet metal flashing:
 - 1. Above door and window trim and casings.
 - 2. Above horizontal trim in field of siding.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with all terms necessary to maintain warranty coverage.
 - 2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
 - 3. Use trim details indicated on drawings.
 - 4. Touch up all field cut edges before installing.
 - 5. Pre-drill nail holes if necessary to prevent breakage.
 - 6. Siding shall be blind nailed.
 - 7. Allow space between both ends of siding panels that butt against trim for thermal movement; seal joint between panel and trim with exterior grade sealant.
 - 8. Place fasteners no closer than 3/8" from the edge of plank.

9. Locate splices at least 12 inches away from window and door openings.
 10. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
 11. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.
 12. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
 13. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations.
 14. Finish Paint touch up. Apply factory supplied touch up paint, matching color of installed material, to all exposed fasteners.
 15. Finish all soffit materials in accordance with Section 09900 Painting.
- B. Cement Fiber Trim and Moldings:
1. Install flashing around all wall openings.
 2. Place fasteners no closer than $\frac{3}{4}$ inch and no further than 2 inch from side edge of trim board and no closer than 1 inch from end. Fasten maximum 16 inch on center.
 3. Trim inside corner with two trim boards.
 4. Install single board at outside corner board then align second corner board to outside edge of first corner board. Do not fasten Cement Fiber board to Cement Fiber board.
 5. Allow $\frac{1}{8}$ inch gap between trim and siding.
 6. Seal all gaps with high quality, paintable caulk.
 7. Shim frieze board as required to align with corner trim.
 8. Install Cement Fiber fascia over structural sub-fascia.

3.03 CLEANUP:

- A. Under the Special Conditions, the General Contractor will provide temporary trash containers for use by all trades, and will haul away and replace the containers at sufficient intervals such that they will be continuously in condition to receive trash and refuse.
- B. During the course of the work at the end of each work day, this Subcontractor shall clean up all trash and debris caused by the work of this Section, including, but not limited to, all discarded materials, discarded cartons; emptied containers; rubble; debris; spent cartridges, accessories and other devices; and other similar refuse, and
(1) deposit them in the temporary containers so provided or (2), should the Subcontractor prefer haul them off the site and legally dispose of them at the Subcontractor's expense. Such cleaning shall be sufficient to result in generally "broom-clean" or raked-clean site" conditions, as applicable.
- C. Perform final cleaning and trash and debris removal, upon final completion of the work of this Section, in similar manner. Such cleaning shall be in addition to, and not in lieu of, other cleaning specified in this Section and elsewhere in the Contract Documents.
- D. Contractor shall use magnetic nail collector or other suitable equipment necessary to remove all nails and scrap metal from the project site.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before substantial Completion.

SECTION 07 53 00
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this Section shall be included in the Roofing and Flashing Filed Sub-Bid. Refer to Section 07 00 02 - Roofing and Flashing Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, erecting, and installing the following Elastomeric Membrane Roofing System work:
1. Elastomeric roofing membrane, adhered conventional application.
 2. Insulation, flat and tapered with insulation crickets, as specified in Section 07 21 00.
 3. Roof Vapor retarder / air barrier (Roof-VR/AIB).
 4. Fire resistive deck sheathing.
 5. Protection board/ Cover board.
 6. Flexible flashings and accessories.
 7. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.
 8. Sealers and adhesives
- B. Materials specified in other sections, to be fabricated, furnished, delivered, and installed by this section includes:
1. Section 07 21 00 - Thermal Insulation: rigid polyisocyanurate insulation board that is part of the roofing system.
 2. Section 07 62 00 - Sheet Metal Flashing and Trim under manufacturer's warranty: Flashing and sheet metal work not provided under other Sections of the Specifications required to provide a complete watertight construction.
 - a. Metal flashings and accessories.
- C. Work to be furnished by other Sections but installed under this Section.
1. Division 23 – HVAC: Elevator penthouse vent unit
 2. Division 22 - Plumbing: Roof drain bodies shall be provided and installed to roof by Section 22 00 01 - Clamping ring shall be installed by the Roofing and Flashing subcontractor following flashing of membrane into drain body.
 3. Division 23 - HVAC: Roof curbs shall be installed to roof by Section 23 00 01. The Roofing and Flashing subcontractor shall coordinate with Section 23 00 01 to provide flashing and/or counter-flashing to curbs as appropriate to curb type and configuration.

1.03 WORK BEING FURNISHED BY THIS SECTION FOR INSTALLATION BY OTHER SECTIONS INCLUDES:

- A. Sheet metal flashings in wall construction above horizontal roof surfaces: furnish to the respective installing contractors:
1. Flashings in non-masonry walls: furnish to the General Contractor.

1.04 RELATED REQUIREMENTS

- A. The Conditions of the Contract General requirements of the Project Manual apply to the Roofing and Flashing subcontractor, material supplier, and other persons furnishing labor and materials under this section. The General Conditions, Supplementary Conditions, GC's Scoping Documents, and applicable parts of Division 01 are included as part of this section
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which the Roofing and Flashing subcontractor must coordinate the work of this section include the following:

1. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.
2. Section 07 21 00 - Thermal Insulation.
3. Section 07 25 00 - Weather Barriers.
4. Section 07 31 13 - Asphalt Shingles
5. Section 07 46 46 - Fiber Cement Siding
6. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings, reglets, and copings and gravel stops.
7. Section 07 72 00 - Roof Accessories: Roof-mounted units; prefabricated curbs.
8. Division 22 - Plumbing Sections: Plumbing vents through roof, installation of roof drain for membrane tie-in and provision of clamping rings for installation by this Section.
9. Division 23 - HVAC Sections: Roof top equipment, fans, gravity vents, chillers and other equipment with curbs requiring flashing and counter-flashing installed by this section, or requiring piping penetrations with roofing penetration flashing provided and installed by this Section.
10. Division 26 - Electrical Sections: lightning protection systems requiring roof penetrations and anchoring.

1.05 **REFERENCE STANDARDS**

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 1. ASTM C79/C79M - Standard Specification for Treated Core and Nontreated Core Gypsum Sheathing Board; 2001.
 2. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 3. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 4. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 5. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers- Tension.
 6. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 7. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
 8. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
 9. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.
 10. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
 11. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
 12. FM P7825 - Approval Guide; Factory Mutual Research Corporation.
 13. FM DS 1-28 - Wind Design; Factory Mutual Research Corporation.
 14. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association.
 15. SPRI RP-4 - Wind Design Standard for Ballasted Single-Ply Roofing Systems; Single Ply Roofing Institute (ANSI/SPRI RP-4).
 16. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc..
 17. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..

1.06 **ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate with installation of associated counterflashings installed under other sections.
- B. Preinstallation Meeting per Section 01 30 00, and as follows:

1. Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.
 2. Review preparation and installation procedures and coordinating and scheduling required and related work.
- C. Sequencing and scheduling per Section 01 32 16.

1.07 **SUBMITTALS**

- A. Construction Submittals:
1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 2. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, fasteners, and protection board, fire resistive deck sheathing.
 3. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, mechanical fastener layout, and paver layout.
 - a. Indicate the following:
 - 1) Outline of roof with roof size and elevations shown.
 - 2) Layout of the tapered insulation and proposed membrane seam layout.
 - 3) Manufacturer's proprietary details required to provide specified warranty
 - (a) Indicate where variations occur particular to this project.
 - (b) Indicate each non-standard detail meeting specified warranty term verified by and documented as acceptable to the system manufacturer.
 - 4) Profile details of flashing methods for penetrations.
 - 5) Fastener and adhesive patterns.
 4. Specimen Warranty: For approval.
 5. Samples for Verification: Submit three samples for each of the following:
 - a. 12 by 12 inch (300 by 300mm) square of:
 - 1) Sheet roofing, of color specified including T-shaped side and end lap seam.
 - 2) Protection board or composite.
 - 3) Roof insulation.
 - 4) Thermal protection board.
 - b. 12 inch (300mm) length of:
 - 1) Metal termination bars
 - 2) Battens
 - c. Unit Items:
 - 1) Typical plumbing vent flashing.
 - 2) Pre-finished metal flashing used under roofing warranty.
 - d. Three (3) fasteners of each type, length, and finish proposed to anchor system components.
 6. Certifications:
 - a. Subcontractor's documentation of acceptance of substrate conditions per Part 3 of this Section.
 - b. Subcontractor's documentation of acceptance of roof drainage as properly functioning prior to commencement of installation.
 - c. Manufacturer: Submit certification that all materials supplied comply with each specified ASTM requirement, and industry standards or practices.

- 1) Certification of the manufacturer's warranty reserve.
 - 2) Submit a letter of certification from the manufacturer which certifies the Roofing and Flashing sub contractor is authorized to install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.
 - d. Subcontractor's certification that the roofing system installed meets each identified code and insurance requirement specified.
 7. Test and Evaluation Reports: For each component of membrane roofing system.
 8. Qualification Statements: For Manufacturer and Applicator.
 9. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
 10. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 11. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
 12. Warranty: Submit sample manufacturer's system warranty and installer's labor warranty.
- B. Closeout Submittals:
1. Submittal Procedures per Section 01 78 00, and as follows:
 - a. Warranty Documentation: Executed warranties.
 - b. Operation and Maintenance Data: Operating, cleaning and maintenance recommendations.
 - 1) Basic owner requirements to maintain warranty.
 - 2) Recommended maintenance guidelines and maintenance schedule.
 - c. Sustainable Design Closeout Documentation: Submit completed LEEDTM submittal Worksheet Templates for the following credits:

1.08 **QUALITY ASSURANCE**

- A. Regulatory Agency Approvals:
1. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to AHJ. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 - a. Exterior Fire-Test Exposure: Class A per ASTM E108, for application and roof slopes indicated.
 - b. Fire-Resistance Ratings of Roof Assemblies: ASTM E119.
- B. Manufacturer Qualifications: Company with a minimum of ten (10) years successful experience that has UL listing for membrane roofing system identical to that used for this Project.
- C. Source Limitations: Obtain each component for membrane roofing system from roofing membrane manufacturer or its designated distributor.
- D. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
1. Maintain one copy on site.
- E. Building Envelope Commissioning will be provided for this project by the Owner. This subcontractor shall cooperate fully with the Building Commissioning Agent to provide access for testing of installed materials, and to repair or remediate conditions identified by the Building Commissioning Agent in order to obtain his acceptance of installed work. Testing of completed roofing systems will be performed by the Owner's testing agent and/or the Building Commissioning agent, and include the following:
1. Infrared thermal imaging scan per ASTM C1153, to identify areas of potentially wet insulation. The roofing subcontractor shall perform test cuts when requested by the Architect or Building

commissioning Agent to investigate potentially wet insulation identified by thermal scans, and replace materials found to be damaged or defective. The extent of damaged material shall be determined at the discretion by the Architect or Building Commissioning Agent based on the interpretations of the thermal scans.

2. Wind uplift of roof assemblies per FM1-52. One test to be performed for each roof assembly type and roof deck area.
3. Fastener pull-out resistance per ANSI/SPRI FX-1. At a minimum three tests will be performed for each roof deck type and fastener combination.
4. Roof Drain Flood Testing in accordance with ASTM D5957, utilizing a 10 foot by 10 foot area around each drain tested. A minimum of two roof drains will be tested. This contractor shall provide labor to provide a non-penetrating temporary flood basin to facilitate the testing, and assist with and witness said testing procedures, and remove the temporary testing basin following successful testing.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, Section 01 60 00 - Product Requirements, and the following:
- B. Deliver products in manufacturer's original containers and wrappings, dry, undamaged, with seals and labels intact.
- C. Store products in weather protected environment, clear of ground and moisture.
- D. Handle materials to prevent damage. Place materials on pallets and fully protect from moisture.
 1. Waterproof Covering: Allow sufficient ventilation to prevent condensation build-up or moisture entrapment in the materials.
- E. Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins.
 1. Un-vented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions, which may affect the ease of membrane installation.
- F. Adhesives shall be stored at temperatures between 40 deg F (5 deg C) and 80 deg F (27 deg C).
- G. Flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.
- H. Damaged materials, as determined by the Owner's Representative or manufacturer, are to be removed from the job site and replaced at no cost to the Owner.
- I. Insulation and roof board shall be kept dry during storage and application. If insulation or roof board becomes wet, it shall not be installed (even if it is later dried). Immediately remove from the site and dispose of wet insulation boards.
- J. Applicator shall take precautions that storage and/or application of materials and/or equipment does not overload the roof deck or building structure.
- K. Protect foam insulation from direct exposure to sunlight.

1.10 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
 1. Proceed with installation only when existing and forecast weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements,
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 90 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.11 WARRANTY

- A. See Section 01 70 00 - Execution and Closeout Requirements, and Section 01 78 00 - Closeout Submittals, for additional requirements.
- B. Installer Warranty: Correct defective Work within a three year period after Date of Substantial Completion. Submit separate installer's warranty. Provide Installer's labor warranty against defective installation workmanship, to include all components for the roofing system damaged due to leaks or failure.
- C. Manufacturer / Special Warranty: Prepare and submit written Total Roofing System warranty covering materials and labor signed by manufacturer of roofing materials and his authorized applicator, without monetary limitation, agreeing to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Failure includes, but is not limited to, leaking roof, damage from wind not in excess of warranty limit, membrane delaminating, fastener pull-out, improperly heat-welded seams, improper terminations.
 - 2. Warranty Term: 30 Years.
 - 3. Warranty Wind Speed: The maximum wind speed coverage shall be peak gusts of design speed listed in structural drawings at 30 feet above ground level. Manufacturers shall provide special wind speed riders if required to meet project requirements.
 - 4. System warranty shall include all components of roofing system provided by the roofing membrane manufacturer.
 - 5. Exceptions NOT Permitted:
 - a. Damage due to excessive foot traffic.
 - b. Damage due to wind of speed greater than 56 mph but less than warranted wind speed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. EPDM Membrane Materials:
 - 1. Basis of Design: Carlisle SynTec; Sure-White EPDM: www.carlisle-syntec.com.
 - 2. Firestone Building Products, LLC: www.firestonebpc.com.
 - 3. Versico Roofing Systems Inc; VersiGard EPDM: www.versico.com.
 - 4. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation:
 - 1. Same manufacturer as roofing membrane.

2.02 ROOFING - UNBALLASTED APPLICATIONS

- A. Elastomeric Membrane Roofing: One ply membrane, fully adhered.
- B. Roofing Assembly Requirements:
 - 1. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980, based on 3-year aged data.
 - a. Field applied coating may not be used to achieve specified SRI.
 - 2. Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- C. Insulation Thermal Value (LTTR), minimum: 34.8. Acceptable Insulation Types:
 - 1. Minimum 2 layers of polyisocyanurate board.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); non-reinforced; complying with minimum properties of ASTM D4637.
 - 1. Membrane Thickness: Min 90 mil (0.09 inch or 2.28 mm).
 - 2. Solar Reflectance: 0.75, minimum, initial, and 0.64, minimum, 3-year, certified by Cool Roof Rating Council.
 - 3. Thermal Emittance: 0.84, minimum, initial, and 0.87, minimum, 3-year, certified by Cool Roof Rating Council.
 - 4. Color: Gray.
 - 5. Tensile Strength value in accordance with ASTM D412.
 - 6. Ultimate Elongation value in accordance with ASTM D412.
 - 7. Hardness value in accordance with ASTM D2240.
 - 8. Tear Strength: 150 lbf/in, measured in accordance with ASTM D624.
 - 9. Water absorption value measured as percent increase in weight, maximum, measured in accordance with ASTM D570.
 - 10. Water Vapor Permeability value in accordance with ASTM E96/E96M.
 - 11. Brittleness Temperature value in accordance with ASTM D746.
- B. Seaming Materials: As recommended by membrane manufacturer for specified Warranty.

2.04 ROOF VAPOR RETARDER / AIR BARRIER (ROOF-VR/AIB)

- A. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials, self-adhering membrane with adhesive laminated to nonwoven fabric, fabricated specifically for the intended purpose.
 - 1. Product meeting air barrier requirements of building code as an air barrier, less than 0.004 cfm per square foot at 1.57 psf air permeance when tested in accordance with ASTM E2178.
 - 2. Products:
 - a. Carlisle Syn Tec: 725 TR.
 - b. Firestone Building Products: V Force vapor barrier membrane.
 - c. Versico Inc.: 725.
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00 – Product Requirements.
 - 3. Provide all accessories required by manufacturer for substrate conditions and for a complete installation, including lap sealants, primers, and adhesives.

2.05 FLASHING

- A. Flexible Sheet Flashing: Manufacturer's standard unreinforced EPDM sheet flashing, 60 mil (1.5 mm) thick, minimum, of same color as sheet membrane approved for use with Adhered Roofing Systems.
 - 1. Types:
 - a. EPDM T-Joint Cover.
 - b. EPDM Walkway Pads.
 - c. Pre- Molded Pipe Flashings.
 - d. Split Pipe Seals.
 - e. Corners.
 - f. EPDM Curb Wrap Corners.
 - g. Molded Sealant Pockets.
 - 2. Materials shall be from same manufacturer as roofing membrane.

2.06 FIRE RESISTIVE DECK SHEATHING AND COVER BOARDS

- A. Glass mat faced gypsum panels, ASTM C1177/C1177M, fire-resistant type.
- B. Products:
 - 1. As recommended and provided by roof membrane manufacturer; deck sheathing and cover board shall be included in manufacturer's system warranty.
- C. Thickness:
 - 1. Fire Resistive Deck Sheathing: 1/2 inch.
 - 2. Cover Board: Per Manufacturer's warranty requirements, but not less than 1/2 inch.

2.07 INSULATION

- A. As specified in Section 07 21 00 - Thermal Insulation, and acceptable to roofing manufacturer as part of roofing system and covered under roofing system warranty.
 - 1. Insulation shall meet all identified code / insurance requirements.
 - 2. Insulation shall be approved in writing by insulation manufacturer for intended use, and for use with membrane materials.
 - 3. Insulation shall be compatible with roof membrane.
 - 4. Insulation shall be accepted by roof system manufacturer.
 - 5. Provide minimum two layers of insulation to achieve the thickness indicated for each roof type. Where multiple layers are used, insulation thickness shall be a minimum of three inches for first layer, three inches for 2nd layer, with a built-up thickness of not less than six inches. Offset joints between layers of insulation. Tapered insulation shall be in addition to and above the minimum thicknesses indicated, such that no area has less than the minimum thickness.
 - 6. Tapered insulation shall provide for a top surface slope of not less than 1/4 inch per foot of the membrane layer.

2.08 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; elastomeric material compatible with membrane.
- B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- C. Membrane Adhesive: As recommended by membrane manufacturer.
- D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- E. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- F. Sealants: As recommended by membrane manufacturer.
- G. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane. Install walkways at all traffic concentration points (such as roof hatches, access doors and rooftop ladders) and all locations as identified by the Drawing. Heat weld walkway membrane pads/rolls to membrane as recommended by membrane manufacturer.
 - 1. Composition: Roofing membrane manufacturer's standard.
 - 2. Surface Color: White.
- H. Metal Termination Bars/Reglets: Manufacturer's standard predrilled stainless steel or extruded aluminum or aluminum bars, approximately 1 by 1/8 inch (25 by 3mm) thick; with anchors for use at walls and large curbs. Use prefabricated reglet mitered inside and outside corners where walls intersect.
- I. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25mm) wide by 0.05 inch (1.3mm) thick, prepunched.
- J. Exposed Fasteners: Type 304 stainless [Factory-coated] steel fasteners and [plastic] plates meeting corrosion-resistance provisions in FMG 4470 or ASCE 7, designed for fastening

membrane to substrate, and acceptable to membrane roofing system manufacturer.

K. Roof edge metal securement: as specified in Section 07 62 00; ANSI/SPREE ES-1 compliant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements, and as follows:

1. Weather Conditions: No rain, snow or frost, and none in the immediate forecast.

B. Work Conditions:

1. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Care should be exercised to provide protection for the interior of the building and to ensure water does not flow beneath any completed sections of the membrane system.
2. Only as much of the new roofing as can be made weather-tight each day, including all flashing, insulation, roof board, and detail work, shall be installed. Insulation and roof board must be covered by membrane same day as laid. Each seam shall be cleaned and made watertight before leaving the job site that day.
3. All work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The building and its contents shall be protected against all risks. Avoid over-use of non-vented direct-fired heaters during winter months. Avoid application of roof board during rains, heavy fogs and other conditions that may deposit moisture on the surface.
4. All surfaces to receive new insulation, membrane, metal roof deck, roofing material of any type, or flashings shall be dry. Should surface moisture occur the Roofing and Flashing subcontractor shall provide the necessary equipment to dry the surface prior to application.
5. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.
6. Uninterrupted water-stops shall be installed at the end of each day's work and shall be completely removed before proceeding with the next day's work. Water-stops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses. Contaminated membrane shall be replaced at no cost to the Owner.
7. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is required, the Roofing and Flashing subcontractor shall provide protection and barriers to segregate the work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over felt or plywood over insulation board shall be provided for all roof areas to receive rooftop traffic during construction.
8. Prior to and during application, all dirt, debris and dust shall be removed from surfaces by vacuuming, sweeping, and similar non-air borne methods.
9. All rooftop contamination that is anticipated or that is occurring shall be reported to the manufacturer to determine the corrective steps to be taken.
10. Roofing and Flashing subcontractor shall verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Roofing and Flashing subcontractor shall report any such blockages in writing to the Owner's Representative for corrective action prior to installation of the roof system. Submit written acceptance of roof drainage system prior to commencing with the work of this section.
11. Prior to installation inspect substrate surfaces. Identify any unsuitable substrate surfaces or conditions to the General Contractor prior to commencing with work of this section. Submit written acceptance of substrate surfaces and conditions prior to commencing with work of this section.

12. Site cleanup, including both interior and exterior building areas that have been affected by construction, shall be completed to the Owner's satisfaction.
13. All landscaped areas damaged by construction activities shall be repaired at no cost to the Owner.
14. Adhered membrane shall not be installed under the following conditions without consulting manufacturer for precautionary steps:
 - a. The roof assembly permits interior air to pressurize the membrane underside.
 - b. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
 - c. The wall/deck intersection permits air entry into the wall flashing area.
15. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Keep lids on unused cans at all times.
16. Roofing and Flashing subcontractor shall follow all safety regulations required by OSHA and other AHJ.

3.02 METAL DECK PREPARATION

- A. Install fire resistant deck sheathing on metal deck:
 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
- B. Mechanically fasten sheathing to roof deck, in accordance with roofing manufacturer's instructions with fastener spacing selected to resist wind uplift.

3.03 VAPOR RETARDER AND INSULATION - UNDER MEMBRANE

- A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
 1. On Steel Deck: For vapor drive leaving the building, the vapor retarder shall be laid directly over the fire resistive deck sheathing with all side and end joints sealed in accordance with the manufacturer's instructions.
 2. VR shall be sealed at each penetration and termination.
 3. VR shall extend to form a continuous seal with adjacent wall vapor retarder/air infiltration barrier (VR/AIB): seal at connection air/water tight.
 - a. Coordinate with Waterproofing, Dampproofing and Caulking subcontractor.
 - b. Installation shall be air and vapor tight to meet MSBC (780 CMR) Energy Code requirements.
 4. Extend vapor retarder under cant strips and blocking to deck edge.
 5. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.
- B. Insulation Installation:
 1. General. Install according to membrane roofing system manufacturer's instructions and recommendations meeting requirements, and as follows:
 - a. Install insulation or membrane underlayment over the substrate with boards butted together. Fill joints or gaps greater than 1/4 inch with manufacturer's recommended sealant.
 - b. Install multiple layers of insulation under area of roofing to achieve required thickness.
 - 1) Cut and fit insulation within 1/4 inch (6mm) of nailers, projections, and penetrations.
 2. Attachment of Insulation: Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions. Use mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - a. Fasten insulation at intervals to resist uplift pressure at corners, perimeter, and field of roof.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

- F. Coordinate depth of roof insulation system installation with wood blocking work provided under Section 06 1000.
 - 1. Preservative treated wood nailers shall be installed at the perimeter of the entire roof and around such other roof projections and penetrations as specified on drawings.
 - 2. Height of nailers shall be matched to that of the insulation thickness being used.
- G. Do not apply more insulation than can be covered with membrane in same day.

3.04 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate of Determined by Manufacturer gal/square. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
 - 3. Secure flashing to nailing strips at 4 inches on center and Insert flashing into reglets and secure.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and sumps and related flashings.

3.05 FLASHING

- A. Flashing of parapets, curbs, expansion joints and other parts of the roof shall be performed using reinforced EPDM membrane. Non-reinforced EPDM membrane may be used for flashing pipe penetrations, Sealant Pockets, and scuppers, as well as inside and outside corners, when the use of pre-molded accessories is not feasible.
- B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.06 WALK PADS

- A. Install walkway pads at all traffic concentration points (such as roof hatches, access doors and rooftop ladders) and all locations as identified by the Drawing.

3.07 DAILY SEAL

- A. When the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.
- B. Use manufacturer's recommended adhesive or other equal material in accordance with the manufacturer's requirements.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field quality control and inspection.
- B. Require site attendance of roofing and insulation material manufacturers periodically during installation of the work. Arrange for visits suitable to observe application of roofing components and as required per system warranties. At a minimum, arrange for not less than one inspection during installation and one inspection immediately following installation of roofing. Submit manufacturer's field reports documenting inspections and observations.
 - 1. Manufacturer's field report shall specifically include inspection of roofing membrane heat welded seams, and indicate acceptance or identify locations and repair instructions where completed work is deemed unacceptable.
- C. Roofing subcontractor shall perform testing of roof membrane seams. Perform not less than two tests

- daily when roofing is being applied. Submit written test results in log form, recording weather conditions, temperature, and other conditions that may affect installation. Submit in a form acceptable to the Architect and Owner.
- D. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
1. Testing will include flood testing and infrared thermography of the membrane surface. Infrared scans may reveal areas of suspected water damage to insulation materials.
 - a. The Roofing and Flashing contractor shall cooperate fully during testing, and perform test cuts of roof surface to make insulation available for inspection and moisture testing.
 - b. Insulation found, in the opinion of the Architect, to be damaged by moisture shall be removed and replaced at no cost to the Owner. The extent of replacement shall be at the discretion of the Architect and/or Owner.
 2. Additional testing and inspecting, at the Roofing and Flashing subcontractor's expense, will be performed to determine compliance of replaced or repaired Work with specified requirements.
- E. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items.
1. Replace damaged materials or items with new if repair is not acceptable to Architect.
 2. Wet insulation materials shall be replaced.
- F. Manufacturer Services per Section 01 40 00, and as follows: Roof membrane system manufacturer's field representative(s) shall give product use recommendations, and perform site visits to inspect product installation in accordance with instructions and warranty requirements.
1. Final Roof Inspection: Manufacturer to perform a warranty inspection of the roofing certifying a proper installation and upon completion, submit a copy of the report to the Architect.

3.09 **CLEANING**

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal, and as follows:
1. Immediately after roofing is installed, remove all construction waste from roof surface.
 2. All new roofing waste material (i.e., scrap roof membrane, empty cans of adhesive) shall be immediately removed from the site by the Applicator and properly transported to a legal dumping area authorized to receive such material.
 3. Clean roof area before beginning work and at the end of each workday. Prior to laying roofing membrane perform a close check to ensure no sharp objects are present on the substrate.
 4. Remove bituminous markings from finished surfaces.
 5. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
 6. Repair or replace defaced or damaged finishes caused by work of this section.

3.10 **PROTECTION**

- A. Immediately after roofing is installed, remove all construction waste from roof surface, including (but not limited to) packaging, strapping, fasteners such as nails and screws, surplus metal flashing and trim and other sharp-edged materials. Notify the General Contractor immediately of unsatisfactory conditions caused by other trades due to accumulation of trash or debris accumulation on completed roofing. Remove materials deposited by others promptly when observed.
- B. Provide thirty (30) rubber walk pads to the General Contractor to be used to protect installed roof membrane where foot traffic must continue over installed roofing. The General Contractor shall verify that roof pads are temporarily placed in areas where subcontractors are performing work at areas of installed roofing. At Substantial Completion, the walk pads shall be delivered to the Owner as extra materials.

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this section shall be included in the Roofing and Flashing Filed Sub-Bid. Refer to Section 07 00 02 - Roofing Flashing and Sheet Metal Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following flashing work:
1. Prefinished metal flashings and counterflashings.
 2. Prefinished metal collection boxes and downspouts.
 3. Prefinished metal gutters.
 4. Underlayment Barrier to separate sheet metal products from preservative pressure treated wood.
 5. Reglets and accessories as needed for a complete installation.
- B. Work furnished by this section, for installation by other sections includes the following:
1. Through-wall flashings for installation in Masonry construction for low roofs meeting high walls shall be furnished by this section to the Masonry Subcontractor for installation within the masonry work. Snap-in counterflashings that get joined to and sealed to the through-wall flashing shall be furnished and installed by the roofing subcontractor.
 2. Through-wall flashings for installation in other than masonry construction for low roofs meeting high walls shall be furnished by this section to the General Contractor for installation within the wall construction. Snap-in counterflashings that get joined to and sealed to the through-wall flashing shall be furnished and installed by the roofing subcontractor.”

1.03 RELATED REQUIREMENTS

- A. The Conditions of the Contract General requirements of the Project Manual apply to the Roofing and Flashing subcontractor, material supplier, and other persons furnishing labor and materials under this section. The General Conditions, Supplementary Conditions and applicable parts of Division 01 are included as part of this section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which the Roofing and Flashing subcontractor must coordinate the work of this section include the following:
- C. Section 06 10 00 - Rough Carpentry: Wood nailers.
- D. Section 07 31 13 - Asphalt Shingles: Flashings associated with shingle roofing.
- E. Section 07 90 05 - Joint Sealers.
- F. Divison 23 – HVAC- Roof mounted units

1.04 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 2. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvalume) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 4. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

5. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
6. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination per Section 01 31 14, and as follows:
 1. Coordinate with installation of associated counterflashings installed under other sections.
- B. Sequencing and Scheduling per Section 01 32 16.
- C. Preinstallation Meeting per Section 01 70 00, and as follows:
 1. Convene one week before starting work of this section. require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.
 - a. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.06 SUBMITTALS

- A. Construction Submittals:
 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 2. Subcontractor's written acceptance of substrate conditions. Submit prior to commencing with work of this section.
 3. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details. Details shall meet roofing system manufacturer requirements for stated warranty.
 - a. Include project specific details for actual project conditions and configurations showing adjacent materials - manufacturer standard details will not be accepted.
 4. Details of roof edge securement complying with code, and certification that roof edge securement meets the ANSI SPRI-ES1 standard required by code.
 5. Samples: Submit two samples 8 x 8 inch in size illustrating each metal finish color.
- B. Closeout Submittals:
 1. See Section 01 78 00 - Closeout Submittals for submittal procedures.
 - a. Warranty:
 - 1) Submit executed warranty on factory-applied metal finishes.

1.07 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements, details included within the contract drawings, and roofing manufacturer's details required for stated warranty.
- B. Provide roof edge fastenings capable of meeting wind and uplift requirements of building code as part of metal roof edge coping systems.
- C. Maintain one copy of document on site.
- D. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, and Section 01 60 00.
- B. Protect materials during shipping, handling, storage, and installation from exposure to weather, water, scratches, and other damage.
- C. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

- D. Prevent contact with materials that could cause discoloration or staining.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide finish warranty for all prefinished sheet metal work, guaranteeing the finish against fading, cracking, peeling, or delamination for a period of 20 years from the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-Finished Galvalume Steel: ASTM A755/A755M, with G90/Z275 zinc coating; minimum.0239 inch thick base metal, shop pre-coated with PVDF coating.
 - 1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system, including specially formulated rust-inhibitive primer, fluoropolymer color coat, and clear fluoropolymer top coat, with both color coat and top coat containing not less than 70 percent polyvinylidene fluoride resin by weight, with minimum total dry film thickness of 1.5 mil complying with AAMA 2605.
 - 2. Colors: to be selected by Architect from manufacturer's full range of standard and custom colors..
- B. Stainless Steel: ASTM A666 Type 304, soft temper, 0.015 inch thick; smooth satin finish.

2.02 PRE-MANUFACTURED ROOF EDGE FLASHINGS AND COPINGS

- A. Roof Edge Flashings and Copings Manufacturer's: Subject to Roof System Manufacturer's approval and required compliance with roof system warranty:
 - 1. Architectural Products Co: www.archprod.com.
 - 2. W.P. Hickman Company: www.wph.com.
 - 3. Metal-Era Inc: www.matalera.com.
 - 4. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: See Section 01 60 00 - Product Requirements.

2.03 COMPONENTS

- A. Roof Edge Flashings: Factory Fabricated to sizes required; mitered, welded corners; concealed fasteners.
 - 1. Configuration: Fascia, cant, and edge securement for roof membrane.
 - 2. Pull off Resistance: Tested in accordance with SPRI ES-1 RE-1 and RE-2 to positive and negative design wind pressure as defined by SPRI ES-1.
 - 3. Material: Extruded Aluminum in thickness as determined by the manufacturer to maintain the specified system warranty.
 - 4. Finish: 70 percent polyvinylidene fluoride.
 - 5. Color: to be selected by Architect from manufacturer's custom range.
- B. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
 - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
 - 2. Pull Off Resistance: Tested in accordance with SPRI ES-1 RE-3 to positive and negative design wind pressure as defined by SPRI ES-1.
 - 3. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
 - 4. Finish: 70 percent polyvinylidene fluoride.
 - 5. Color: To be selected by Architect from manufacturer's custom range.

2.04 ACCESSORIES

- A. Fasteners: Stainless steel.
- B. Metal Accessories: Provide cleats, straps, hangers, anchoring devices, and similar accessory units as required for installation of work, noncorrosive, size and gage required for performance.
- C. Underlayment Barrier: Provide one of the following:
 - 1. ASTM D226, organic roofing felt, Type I ("No. 15").
 - 2. Self adhering vapor retarder / air barrier; same material as selected for membrane roofing system. Formulation for high temperature resistance.
- D. Primer: Zinc chromate type.
- E. Sealant: Type B1 specified in Section 07 90 05.

2.05 **FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, minimum 2 inches wide, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with lap and backer plate seams per drawings, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
 - 1. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25mm) deep, filled with elastomeric or butyl sealant concealed within joints.
- F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.06 **GUTTER AND DOWNSPOUT FABRICATION**

- A. Gutters: SMACNA Architectural Sheet Metal Manual, Rectangular profile.
- B. Downspouts: Oval profile.
- C. Gutters and Downspouts: Sizes indicated.
- D. Accessories: Profiled to suit gutters and downspouts.
 - 1. Anchorage Devices: In accordance with SMACNA requirements. Fasteners shall be stainless steel for fastening into pressure treated lumber.
 - 2. Gutter Supports: Brackets.
 - a. Brackets shall be fabricated of 1/8 inch thick Galvalume steel finished to match gutter, and include matching concealed straps across top of gutter.
 - 3. Downspout Supports: Brackets.
- E. Downspout Boots: formed to make transition from gutter to round drainage pipe at grade as indicated in drawings.
- F. Seal metal joints.

PART 3 EXECUTION

3.01 **EXAMINATION**

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
 - 1. Carefully examine installation areas with Fabricator and Installer present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, surfaces, substrates, structural support, utility penetrations, tolerances, slope, cleanliness and other conditions are satisfactory and ready to receive Work.

- b. Verify that substrate system is even, smooth, sound, clean, dry, and free from defects.
 - c. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
 - d. Verify roofing termination and membrane base flashings are in place, sealed, and secure.
 - e. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Submit written acceptance of substrate conditions prior to commencing with the work of this section.

3.02 **INSTALLATION**

- A. General: Install Sheet Metal Flashing and Trim according to the Drawings, submittals, manufacturer's instructions, SMACNA (ASMM), and as follows:
 - 1. Counter Flashings: SMACNA Architectural Sheet Metal Manual, Detail 4-4C.
 - 2. Roof Penetration Flashing: SMACNA Architectural Sheet Metal Manual, Detail 4-14B.
- B. Install units plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction.
- C. Provide a underlayment barrier between metal surfaces of units in contact with dissimilar metals, and between metal and pressure treated wood.
- D. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- E. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- F. Seal metal joints watertight.
- G. Install expansion joints at frequency recommended by SMACNA (ASMM). Do not fasten moving seams such that movement is restricted.
- H. Coordinate with installation of roofing system and roof accessories.
- I. Secure gutters and downspouts in place using concealed fasteners.
- J. Install continuous gutter guards at all gutters.
- K. Connect downspouts to downspout boots. Grout connection watertight.
- L. Fabricate, support and anchor flashing work to withstand thermal expansion stresses and full loading by water or ice, without damage, deterioration or leakage.
- M. Counterflash mechanical and electrical items projecting through roofing, unless otherwise shown.
- N. No exposed face penetrations or perforation shall be made in metal panels by fasteners without Architect's specific approval.

3.03 **CLEANING**

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
- B. Remove protective film (if any) from exposed surfaces of sheet metal promptly upon installation. Strip with care to avoid damage to finishes.
- C. Clean exposed sheet metal surfaces, removing substances that might cause abnormal discoloration of metal.
- D. Upon completion of each area of soldering, carefully remove flux and other residue from surfaces. Neutralize acid flux by washing with baking soda solution, and then flushing clear water rinse. Use special care to neutralize and clean crevices.
- E. Clean exposed metal surfaces of substances that would interfere with uniform oxidation and weathering.

3.04 **SCHEDULE**

- A. Counterflashings at Roofing Terminations (over roofing base flashings): Stainless steel.
- B. Fascia Flashing over Gutters and at Roof Perimeter: Prefinished PVDF on Galvalume on sheet steel.
- C. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports: Thermoplastic type to match roof membrane.

SECTION 07 84 00 FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems. Firestopping of all joints and penetrations in fire-resistance rated and non-rated floor and wall assemblies, whether indicated on drawings or not.
- B. All firestopping required for the project for protection of through-penetrations and building joints shall be furnished and installed by this Section.
- C. Firestopping of through-penetrations for the Work of the Fire Protection, Plumbing, HVAC, or Electrical Filed Sub-Bid categories shall be performed by the respective Filed Sub Bid Contractor making the penetration.
- D. Details that require fire stopping include the following, but are not limited to:
 - 1. Penetrations through fire-resistance-rated floor and ceiling/roof construction requiring protected openings including both empty openings and openings that contain penetrations (including vertical shaft walls and partitions).
 - 2. Sealant joints in fire-resistance-rated construction (floors, walls or roof).
 - 3. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
 - 4. Openings between structurally separate sections of wall or floors.
 - 5. Gaps between the top of walls and ceilings of roof assemblies.
 - 6. Openings and penetrations in walls containing fire doors.
 - 7. Openings around structural members penetrating floors or walls.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract General requirements of the Project Manual apply to this Subcontractor, material supplier, and other persons furnishing labor and materials under this section. General Conditions, Supplementary Conditions and applicable parts of Division 01 are included as part of this section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.
 - 2. Section 03 30 00 - Cast-In-Place Concrete.
 - 3. Section 04 20 00 - Masonry.
 - 4. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.
 - 5. Division 21 - Fire Protection.
 - 6. Division 22 - Plumbing.
 - 7. Division 23 - HVAC.
 - 8. Division 26 - Electrical.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 2. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

3. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc..
4. FM 4991 - Approval Standard for Firestop Contractors; Factory Mutual Research Corporation.
5. FM P7825 - Approval Guide; Factory Mutual Research Corporation.
6. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; www.aqmd.gov.
7. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: See Section 01 70 00.
- B. Sequencing and Scheduling per Section 01 32 16, and as follows:
 1. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements. Coordinate sequence of work with the work of other trades.
 2. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

1.05 SUBMITTALS

- A. Construction Submittals:
 1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
 - a. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
 - b. Product Data: Provide data on product characteristics.
 - c. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
 - d. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - e. Schedule of materials: Submit a schedule of materials indicating the firestop system to be utilized for each different firestopping application in tabular form and identify:
 - 1) Include all of the individual materials required for each complete system.
 - 2) Indicate manufacturer's product name and nomenclature for each material.
 - 3) Type of penetration or opening type by design designation of qualified testing and inspecting agency with location of each.
 - 4) Types of construction assembly penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
- B. Closeout Submittals:
 1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements, and Section 01 78 00 - Closeout Submittals:
 - a. Warranty Documentation: Executed warranties.
 - b. Operation and Maintenance Data: Operating, cleaning and maintenance recommendations.
 - 1) Basic owner requirements to maintain warranty.
 - 2) Recommended maintenance guidelines and maintenance schedule.

1.06 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the specified fire ratings when tested in accordance with methods indicated.
 - 1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
 - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. With minimum 5 years documented experience installing work of this type.
 - 2. Able to show at least 5 satisfactorily completed projects of comparable size and type.
 - 3. Having received and passed all training, licensing and approvals as required by the firestopping system manufacturer.
- D. Single Source Responsibility: To the greatest extent practical, obtain firestop materials from single manufacturer.
 - 1. All trades required to provide firestopping and coordinate with each other to provide products from the same manufacturer.
 - 2. Materials of different firestop manufacturers shall not be intermixed in the same firestop system or opening - if not part of that firestop system.
 - 3. Tested and listed firestop systems are to be used before an engineering judgment (EJ) is requested, even if from another manufacturer.

1.07 MOCK-UP

- A. Install one firestopping assembly representative of each fire rating design required on project.
 - 1. Where one design may be used for different penetrating items or in different wall, floor, or roof constructions, install one assembly for each different combination.
 - 2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.
- B. If accepted, mock-up will represent minimum standard for the Work.
- C. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.08 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

- A. Firestopping: Any material meeting requirements.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.02 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 - 1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E 814 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating of 1 and that meets all other specified requirements.

2.03 PERFORMANCE / DESIGN CRITERIA

- A. Performance Requirements -Provide and install firestopping systems that are produced to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases. Include the following:
 - 1. Firestop each penetration through rated construction to the approval of the authority having jurisdiction (AHJ).
 - 2. Provide and install complete firestopping systems that are designed and approved for the specific construction to be firestopped.
 - 3. Provide and install firestop materials of thickness, width, and density required.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop system with F (flame) ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide firestop systems with T (temperature) ratings, in addition to F ratings, as determined per ASTM 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupied floor areas. T-rated assemblies are required where the following conditions exist where firestop systems protect:
 - 1. Penetrations located outside of wall cavities.
 - 2. Penetrations located outside fire-resistive shaft enclosures.
 - 3. Penetrations located in construction containing doors required to have a temperature-rise rating.
 - 4. Penetrating items larger than a 4 in. diameter nominal pipe of 16 sq. in. in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per UL 2079 and/or ASTM E 119 and E 1966, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide through-penetration firestop systems with elastomeric qualities.
 - 2. For floor penetrations with annular spaces exceeding 4 in. or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.04 MATERIALS

- A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
 - 1. Durability and Longevity: Permanent.
 - 2. Manufacturers:
 - a. A/DFire Protection Systems Inc: www.adfire.com.
 - b. 3M Fire Protection Products: www.3m.com/firestop.
 - c. Hilti, Inc: www.us.hilti.com.
 - d. Specified Technologies, Inc: www.stifirestop.com.
- C. Foam Firestopping: Single component silicone foam compound; conforming to the following:
 - 1. Durability and Longevity: Permanent.

2. Manufacturers:
 - a. 3M Fire Protection Products: www.3m.com/firestop.
 - b. Hilti, Inc: www.us.hilti.com.
 - c. Specified Technologies, Inc: www.stifirestop.com.
- D. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers; conforming to the following:
 1. Durability and Longevity: Permanent.
 2. Manufacturers:
 - a. A/DFire Protection Systems Inc: www.adfire.com.
 - b. USG: www.usg.com.
- E. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening; conforming to the following:
 1. Durability and Longevity: Permanent.
 2. Manufacturers:
 - a. A/DFire Protection Systems Inc: www.adfire.com.
 - b. Pecora Corporation: www.pecora.com.
 - c. Thermafiber, Inc: www.thermafiber.com.
- F. Firestop Devices - Wrap Type: Mechanical device with incombustible filler and sheet stainless steel jacket, intended to be installed after penetrating item has been installed; conforming to the following:
 1. Durability and Longevity: Permanent; suitable for pedestrian traffic.
 2. Manufacturers:
 - a. RectorSeal: www.rectorseal.com.
 - b. 3M Fire Protection Products: www.3m.com/firestop.
 - c. Hilti, Inc: www.us.hilti.com.
 - d. Specified Technologies, Inc: www.stifirestop.com.
- G. Intumescent Putty: Compound that expands on exposure to surface heat gain; conforming to the following:
 1. Durability and Longevity: Permanent.
 2. Manufacturers:
 - a. RectorSeal: www.rectorseal.com.
 - b. 3M Fire Protection Products: www.3m.com/firestop.
 - c. Hilti, Inc: www.us.hilti.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to arrest liquid material leakage.
- D. Coordinate with fire protection, plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable, and other items that penetrate fire rated construction have been permanently

installed prior to installation of firestops and smoke seals.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Install labeling required by code.

3.04 INSTALLATION / APPLICATION

- A. Regulatory Requirements: Install firestop materials in accordance with published Through-Penetration Firestop Systems in UL (BMD) or the publication of another approved independent laboratory.
- B. Manufacturer's Instructions: Comply with regulatory and manufacturer's instructions for installation of firestopping materials.
 - 1. Seal all joints to ensure an air and water resistant seal, capable to withstand compression and extension due to thermal, wind or seismic joint movement.
 - 2. Notify CM/GC prior to installation of firestop systems that might hamper the performance of fire dampers.
 - 3. Installing Penetration Firestop Systems:
 - a. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
 - 4. Installing Firestop Joint Systems:
 - a. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instruction and drawings pertaining to products and applications indicated.
 - b. Install joint fillers to provide support of sealants and/or materials during application and at the position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
 - c. Install systems by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability.
 - d. Tool non-sag sealants immediately after application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 5. Installing Firestopping Insulation: Comply with applicable codes and standards.
 - a. Identification: Identify firestop systems with permanently attached preprinted metal or plastic labels.

3.05 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 90 05
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following joint sealant work:
 - 1. Precompressed foam sealers.
 - 2. Hollow gaskets.
 - 3. Accessories as needed for a complete installation, including primers and bond breaker tapes.
- B. The Work of this section shall include sealants and related accessories indicated throughout the drawings and specified, and joints between dissimilar surfaces visible in the finished spaces, including but not limited to the following:
 - 1. Joints between running wood trim and substrate surfaces.
 - 2. Perimeter of access panels in drywall.
 - 3. Perimeter of hollow metal door frames.
 - 4. Perimeter of access panels in masonry.
 - 5. Joints between masonry and gypsum wall board surfaces at walls and ceilings.
 - 6. Joints at perimeter of casework and counters at adjacent walls
 - 7. Perimeter of metal cabinets installed into or onto the face of wall surfaces, including but not limited to Fire Extinguisher, AED units, Fire Alarm, Water Fountains and Coolers, Mixing Valves, Tempering Valves, and other cabinets when specified.
 - 8. Sanitary caulking at bathroom fixtures
 - 9. Perimeter of lockers to adjacent surfaces
 - 10. Secondary sealants at exterior window and door locations as indicated in drawings.
- C. Sealants being furnished and installed by other trades include the following:
 - 1. Section 04 00 01 - Masonry Filed Sub-Bid: sealants and adhesive sealants within wall flashing assemblies required to facilitate the installation of the work.
 - 2. Section 07 00 02 - Roofing and Flashing Filed Sub-Bid: sealants and adhesive sealants within sheet metal roofing, shingle roofing, single ply membrane roofing, and sheet metal flashings required to facilitate the installation of roofing products.
 - 3. Section 08 00 01 - Metal Windows Filed Sub Bid: Primary weather proof sealant at perimeter of window, curtainwall, and storefront assemblies installed simultaneously with the frames.
 - 4. Section 08 00 02 - Glazing Filed Sub Bid: Glazing sealants and caulks used to install glazing panels within openings.
 - 5. Section 09 00 02 - Tile Filed Sub Bid: Sealants used as tile grout at control joints in floor and wall tile.
 - 6. Section 23 00 01 - HVAC Filed Sub Bid: Sealants used for installation of ductwork and mechanical items.
 - 7. Division 32 Exterior Improvements: Sealants indicated in Civil and Landscape drawings shall be provided by the Division 32 Subcontractor(s).
 - 8. Other sealants specifically identified on drawings as belonging to specific Sections.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract General requirements of the Project Manual apply to this Subcontractor, material supplier, and other persons furnishing labor and materials under this section. General Conditions, Supplementary Conditions and applicable parts of Division 01 are included as part of this section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or

with which this contractor must coordinate the work of this section include the following:

1. Section 07 25 00 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders:
2. Section 07 84 00 - Firestopping: Firestopping sealants.
3. Section 08 80 00 - Glazing: Glazing sealants and accessories.
4. Section 09 21 16 - GYPSUM BOARD ASSEMBLIES: Acoustic sealant.

1.03 REFERENCE STANDARDS

- A. Reference Standards per Section 01 40 00
1. ASTM C1193 - Standard Guide for Use of Joint Sealants.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with other sections referencing this section.

1.05 SUBMITTALS

- A. Construction Submittals
1. Product Data: Provide data indicating sealant chemical characteristics.
 2. Samples: Submit three samples, 2 inch in size illustrating sealant colors for selection.
 3. Manufacturer's Installation Instructions: Indicate special procedures.
- B. Closeout Submittals
1. Submittal Procedures per Section 01 78 00, and as follows:
 - a. Warranty Documentation: Executed warranties.
 - b. Operation and Maintenance Data: Operating, cleaning and maintenance recommendations and schedule, and basic owner requirements to maintain warranty.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.07 MOCK-UP

- A. The project scope includes a stand-alone mock-up assembly representative of the exterior envelope of the building, and includes the Work of this section. The mock-up shall include wall and roof components including (but not limited to) cold-formed metal framing, sheathing, insulation, brick and calcium silicate masonry veneer, pre-cast architectural concrete, windows, roof edge and coping, and other components of the exterior envelope. as described in Section 01 40 00 - Quality Requirements, to remain in place for the duration of the Project.
- B. Following acceptance of submittals for material components and selection of colors provide materials of each color selected, installed in place on the mock up for final review by Architect prior to proceeding with the Work.
1. The mock-up shall be constructed full size as indicated in the Drawings, and include construction of a corner, a "T" intersection, a window head, sill and jamb condition with precast sill and head units, and utilizing specified or selected colors of joint sealants.
 - a. Exterior brick, cast stone, and architectural precast concrete, specified mortar, precast concrete products, control joint construction, and through wall flashing details in the relationship as shown on the Drawings.
 2. Do not start exterior sealant work until mock-ups are accepted by Owner and Architect.
 3. Modify and/or replace mock-ups as many times as necessary to obtain Architect's and Owner's approval.
- C. Provide mock-up of sealant joints in conjunction with window under provisions of Section 01 40 00.
- D. Construct mock-up with specified sealant types and with other components noted.

- E. Locate where directed.
- F. Mock-up may not remain as part of the Work.

1.08 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 3 EXECUTION

2.01 EXAMINATION

- A. Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - 1. Verify that substrate surfaces are ready to receive work.
 - 2. Verify that joint backing and release tapes are compatible with sealant.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

2.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

2.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Apply primer to joints as necessary. If primer is applied to exposed surfaces outside sealed joints, remove it immediately using methods and materials recommended by primer manufacturer.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- H. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

2.04 FIELD QUALITY CONTROL

- A. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items.
 - 1. Replace damaged materials or items with New if repair not acceptable to Architect.

2.05 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, and delivering, the following hollow metal (HM) products as specified, as scheduled, and as shown in the Contract Documents.
 - 1. Non-fire-rated steel doors and frames.
 - 2. Steel frames for wood doors.
 - 3. Fire-rated steel doors and frames.
 - 4. Thermally insulated steel doors.
 - 5. Steel glazing frames.
 - 6. Accessories, including glazing and anchors, and fasteners.
- B. Products of this Section shall be furnished to the following sections for installation per the Part 3 requirements stated herein:
 - 1. Section 04 20 00 - Unit Masonry: Doors to be incorporated into masonry partitions.
 - 2. Section 06 20 00 - Finish Carpentry: Doors to be incorporated into partitions other than masonry.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 04 20 00 - Unit Masonry: Incorporation and grouting of frames in masonry construction.
 - 2. Section 06 20 00 - Gypsum Wallboard Assemblies: Setting frames in place for incorporation into stud framed walls.
 - 3. Section 07 21 00 - Thermal Insulation: Low-expanding foam insulating sealant: Cavity filling of frames at exterior openings.
 - 4. Section 08 71 00 - Door Hardware: Door and frame hardware, gaskets, weatherstripping, and installation templates.
 - 5. Section 08 80 00 - Glass and Glazing: Glass, glazing, gaskets, weatherstripping for doors and borrowed lites.
 - 6. Section 09 90 00 - Painting: Field finishing of hollow metal doors and frames.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ANSI. American National Standards Institute; www.ansi.org.
 - a. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
 - b. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - c. ANSI A151.1-1980 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings
 - 2. ASTM. ASTM International; www.astm.org.

- a. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - b. ASTM A 366-85, Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
 - c. ASTM A 569-85, Specification for Steel, Carbon, (0.15 maximum percent), Hot-Rolled Sheet and Strip, Commercial Quality.
 - d. ASTM A 653/A 653M - Standard Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - e. ASTM B 117-85 Method of Salt Spray (Fog) Testing.
 - f. ASTM D 1735-87 Practice for Testing Water Resistance of Coating Using Water Fog Apparatus.
 - g. ASTM E 152-81a Method for Fire Test of Door Assemblies.
- 3. NAAMM. national Association of Architectural Metal Manufacturers; www.naamm.org.
 - a. NAAMM/ HMMA Hollow Metal Manual.
 - b. HMMA. HM Manufactures Association, a division of NAAMM; www.naamm.org/hmma/hmma_technical_literature.aspx.
 - c. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames.
 - 4. NFPA. National Fire Protection Association; www.nfpa.org.
 - a. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
 - 5. UL. Underwriters Laboratories Inc.; www.ul.org.
 - a. UL (BMD) - Building Materials Directory.
 - b. UL 10B - Standard for Fire Tests of Door Assemblies.
 - c. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.04 SUBMITTALS

- A. Construction Submittals:
 - 1. See Section 01 30 00 - Administrative Requirements for submittal procedures.
 - 2. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
 - 3. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
 - 4. Submit Test Reports and Certificates for labeled doors and frames.
 - 5. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
 - 6. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- B. Closeout Submittals:
 - 1. Submittal Procedures: Section 01 78 00 - Closeout Submittals, for submittal procedures.
 - a. Warranty Documentation: Executed warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years' experience.
- B. Single Source Responsibility: Furnish Hollow Metal Doors and Frames system materials of this Section from one manufacturer for entire Project.
- C. Maintain at the project site a copy of all reference standards dealing with installation.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, NAAMM/ HMMA Hollow Metal Manual requirements, Section 01 60 00, and as follows:
 - 1. Remove wraps or covers from doors and frames upon delivery at the building site.
 - 2. Promptly clean and touch up with rust inhibitive primer each scratch or disfigurement caused by shipping or handling.
 - 3. See that materials are properly stored on planks or dunnage in a dry location.
 - 4. Doors shall be stored in a vertical position spaced with blocking.
 - 5. Materials shall be covered to protect them from damage in such a manner as to permit air circulation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Doors and Frames:
 - 1. Assa Abloy Ceco or Curries: www.assaabloydss.com.
 - 2. Black Mountain Door (Amweld): www.blackmountaindoor.com.
 - 3. Pioneer Industries Inc.: www.pioneerindustries.com.
 - 4. Republic Doors: www.republicdoor.com.
 - 5. Steelcraft: www.steelcraft.com.
 - 6. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.

2.02 PERFORMANCE/ DESIGN CRITERIA

- A. Performance Criteria:
 - 1. Fire Labeled Doors and Frames: Construct in accordance with UL-10b (ASTM E152) and as approved by Underwriters Laboratories or other recognized testing agency having a factory inspection service.
 - a. If a door or frame specified to be fire rated cannot qualify for appropriate labeling because of its design, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.
 - 2. Fabrication Methods and Product Quality: In accordance with NAAMM/ HMMA Hollow Metal Manual.

2.03 REQUIREMENTS FOR ALL HOLLOW METAL DOORS AND FRAMES

- A. Door Top Closures: Flush with top of faces and edges.
- B. Door Edge Profile: Beveled on both edges.
- C. Door Texture: Smooth faces.
- D. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- E. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
- F. Galvanizing Units at exterior, high humidity spaces, unconditioned spaces, areas subject to frequent water contact, and as indicated in schedule: All components hot-dipped zinc-iron alloy-coated (galvannealed), A60/ZF180.
- G. Finish: Factory primed, for field finishing.
- H. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.04 HOLLOW METAL DOORS

A. Exterior Doors :

1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
2. Grade: NAAMM HMMA 860, physical performance Level A.
3. Face Sheets: Not less than 16 gage.
4. Core: Polyurethane foam.
5. Top Closures for Outswinging Doors: Flush with top of faces and edges.
6. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
7. Insulating Value: U-value of 10, when tested in accordance with ASTM ASTM C1199, ASTM E1423, SDI 113 and NFRC 100.
8. Weatherstripping: Separate, see Section 08 71 00.

B. Interior Doors, Non-Fire-Rated:

1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless unless indicated as otherwise in the drawings or specified herein.
2. Thickness: 1-3/4 inches.

C. Interior Doors, Fire-Rated:

1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless unless indicated as otherwise in the drawings or specified herein.
2. Face Sheets: Not less than 18 gage.
3. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
 - a. Provide units listed and labeled by UL.
 - b. Attach fire rating label to each fire rated unit.
4. Core: Mineral fiberboard.

2.05 HM FRAMES

A. General:

1. Comply with the requirements of grade specified for corresponding door.
 - a. ANSI A250.8 Level 1 Doors: 16 gage frames.
 - b. ANSI A250.8 Level 3 Doors: 14 gage frames for exterior locations; 16 gage frames for interior locations.
 - c. ANSI A250.8 Level 4 Doors: 12 gage frames.
 - d. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 16 gage .
2. Finish: Same as for door.
3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
5. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

B. Exterior Door Frames: Fully welded type with integral thermal break.

1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
2. Weatherstripping: Separate, see Section 08 71 00.

3. Thermal Break: Manufacturer's standard PVC thermal break configuration.
 4. Provide 4-sided frames where indicated or scheduled in drawings.
- C. Interior Door Frames, Non-Fire-Rated: Face welded type except where knock-down frames are specifically scheduled or permitted by the Architect. Knock-down frames will only be allowed in certain instances for renovation / replacement when expressly allowed by the Architect.
- D. Interior Door Frames, Fire-Rated: Face welded type.
1. Fire Rating: Same as door, labeled.
- E. Mullions for Pairs of Doors: Removable type as scheduled, or if not scheduled, fixed type similar in profile to frame; refer to Section 08 71 00 - Finish Hardware.
- F. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.
- G. Transom Bars: Fixed, of profile same as jamb and head.

2.06 ACCESSORY MATERIALS

- A. Glazing: As specified in Section 08 80 00, installed in field.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Astragals for Double Doors: Specified in Section 08 71 00.
- D. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited. To be provided by Section 04 20 00 - Unit Masonry.
- E. Silencers: Resilient rubber, fitted into drilled holes, specified in Section 08 71 00; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- F. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.07 FINISH MATERIALS

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. HM doors and frames furnished to Section 04 20 00 or Section 06 20 00 for installation, shall be in accordance with the requirements of the specified door grade standard, NAAMM HMMAA Hollow Metal Manual requirements, approved submittals, Drawings, and as follows:
1. In addition, install fire rated units in accordance with NFPA 80.
 2. Coordinate frame anchor placement with wall construction. Provide metal shims as needed.
 3. Exposed field welds shall be finished smooth and touched up with a rust inhibitive primer.
 4. The Section 04 20 00 Unit masonry contractor shall grout frames at masonry construction using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames. See Section 04 20 00.
 - a. Grout or other bonding material shall be cleaned off the frames or doors immediately following installation.

- b. HM surfaces shall be kept free of grout, tar, or other bonding material or sealer.
- 5. Coordinate installation of hardware with the 08 71 00 contractor.
- 6. Coordinate installation of glazing.
- 7. Tolerances:
 - a. Clearances Between Door and Frame: As specified in ANSI A250.8.
 - b. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for Additional requirements.
- B. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items prior to inspection for Substantial Completion.
 - 1. Finish touch-up damaged surface finishes.
 - 2. Replace damaged materials or items with New if repair is not acceptable to Architect.

3.05 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal

3.06 PROTECTION

- A. Protect installed work from subsequent construction operations until date of Final Completion or Owner Occupancy, whichever occurs first.

3.07 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 06 20 00 - Finish Carpentry: Wood door frames.
 - 2. Section 08 11 13 - Hollow Metal Doors and Frames.
 - 3. Section 08 71 00 - Door Hardware.
 - 4. Section 08 80 00 - Glazing.

1.02 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM. ASTM International; www.astm.org.
 - a. ASTM E413 - Classification for Rating Sound Insulation.
 - b. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems.
 - 2. AWI. American Wood workers Institute; www.awinet.org.
 - a. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
 - 3. NFPA. National Fire Protection Association; www.nfpa.org.
 - a. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
 - 4. UL. Underwriters Laboratories Inc.; www.ul.org.
 - a. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc..
 - b. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
 - c. UL 752 - Standard for Bullet-Resisting Equipment.
 - d. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
 - 5. OTC (VOC limits). Ozone Transport Commission; www.otcair.org.
 - 6. WDMA. Window and Door manufacturers Association; www.wdma.com.
 - a. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; Window and Door Manufacturers Association. (ANSI/WDMA I.S. 1A)

1.03 SUBMITTALS

- A. Construction Submittals:
 - 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - 2. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
 - 3. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

- a. Provide the information required by AWI/AWMAC/WI (AWS).
- 4. Include certification program label.Specimen warranty.
- 5. Test Reports: Show compliance with specified requirements for the following:
 - a. Sound-retardant doors and frames; sealed panel tests are not acceptable.
 - b. Bullet resistant doors and frames.
- 6. Samples: Submit three samples of door construction, 5 by 5 inch in size cut from top corner of door.
- 7. Samples: Submit three samples of door veneer, 8 by 10 inch in size illustrating wood grain, stain color, and sheen.
- 8. Manufacturer's Installation Instructions: Indicate special installation instructions.
- B. Closeout Submittals:
 - 1. Submittal Procedures: Section 01 78 00 - Closeout Submittals, for submittal procedures.
 - a. Warranty Documentation: Executed warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years of experience.
- B. Single Source Responsibility: Furnish flush door system materials from one manufacturer for entire Project, unless otherwise acceptable to Architect.
- C. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.05 FIELD CONDITIONS

- A. Ambient Conditions: Before doors are delivered, inspect the site to determine that ambient conditions are enclosed and dry, with a constant temperature and humidity acceptable to the installer and in accordance with the quality standard indicated and the manufacturer's requirements.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
 - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Eggers Industries: www.eggersindustries.com.
 - 2. Marshfield DoorSystems, Inc.: www.marshfielddoors.com.
 - 3. VT Industries, Inc. : www.vtindustries.com
 - 4. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.

2.02 DOORS

- A. All Doors: See drawings for locations and additional requirements.
 - 1. Quality Level: Custom Grade, Standard Duty performance, in accordance with WDMA I.S. 1A.
 - 2. Wood Veneer faced Doors: 5-ply only. 7-ply or 9-ply face veneers are not acceptable.
 - 3. All products of this section shall be free of urea-formaldehyde.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at all locations ; Stave core not acceptable.

2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with NFPA 252 or UL 10C; UL or WH (ITS) labeled without any visible seals when door is closed. Door panels shall meet UL-10C Category A with intumescent within door edge.
3. Bullet Resistant Doors: UL 752 Level 1.
4. Wood veneer facing with factory transparent finish at all wood veneer doors.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC-5), plies and faces as indicated above. Particle core to be type 1-LD-2. High Density 37# particle core allowed in lieu of blocking to achieve WDMA Extra Heavy Duty performance
 1. Non- rated doors with more than 40% of the door area removed for lites or louvers shall be SCLC (structural composite lumber core). These doors shall be fully warranted per the requirements of this section.
- B. Fire Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.
 1. Fire rated doors shall be Category A. Frame applied intumescent is not acceptable.
- C. Bullet Resistant Doors: Equivalent to Type bonded particleboard core (PC); rating, plies, and faces as indicated.

2.04 DOOR FACINGS

- A. Wood Veneer Facing for Transparent Finish: Cherry, veneer grade as specified by quality standard, plain sliced, slip veneer match, balance assembly match.
 1. Vertical Edges: Same species as face veneer.
 2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.
- B. Facing Adhesive: Type I - waterproof, hot press system, urea formaldehyde-free.

2.05 ACCESSORIES

- A. Glazing Stops (non- rated): Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
- B. Glazing Stops (45 minute or higher rated): Provide manufacturer's flush profile veneer wrapped composite to match non-rated doors.
- C. Astragals for Fire Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge, specifically for double doors.

2.06 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
 2. Provide solid blocking for other throughbolted hardware.
 3. No staved lumber cores or hollow cores.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- E. Provide edge clearances in accordance with the quality standard specified.

2.07 FACTORY FINISHING - WOOD VENEER DOORS

- A. Factory finish doors in accordance with WDMA I.S.1A (F-1) PREMIUM (F-6) quality standard.

1. Transparent UV Cured Polyurethane, per WDMA TR-6.
 - a. Stain: As selected by Architect from full selection of standard color options.
 - b. Sheen: Satin.
 2. Prior to finishing, doors shall be clean and dry with moisture content not to exceed 8% average.
- B. Finish work in accordance with WDMA I.S. 1A for Grade specified and as follows:
- C. Factory finish doors in accordance with approved sample.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
1. Carefully examine installation areas with Installer/ Applicator present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, surfaces, substrates, structural support, utility connections, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - 1) Inspect all door frames and conditions before commencing installation of doors.
 - 2) Verify that opening sizes and tolerances are acceptable.
 - 3) Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Flush wood doors furnished to Section 06 20 00 for installation in accordance with WDMA I.S.1A J-1 requirements, manufacturer's instructions, approved submittals, The Drawings, and as follows:
1. Install fire-rated doors in accordance with NFPA 80 requirements.
 2. Install doors with protective covering intact to protect doors during construction. Remove as needed for installation of hardware and lite kits, or before final inspection.
 3. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
 4. Use machine tools to cut or drill for hardware.
 - a. All locks, exit devices, door closers, and other hardware shall be installed in accordance with the manufacturer's written instructions and NFPA 80 requirements.
 - b. Drill pilot holes of recommended size for wood screws required to fasten the hardware before screws are fastened into the wood door.
 - c. Shim hinges as needed to provide equal and proper clearance at each side of door. Hinge pilot holes to be drilled by manufacturer.
- B. Coordinate installation of doors with installation of frames and hardware.
- C. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Conform to WDMA I.S.1A, P-3 and J-1, for:
1. Fit and clearance tolerances.
 2. Maximum diagonal distortion.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Site Tests, Inspection: Per Section 08 71 00, AHC to inspect each flush door in opening with Contractor and adjust to proper working order prior to Substantial Completion inspection.

1. Adjust doors for smooth and balanced door movement.
 2. Rehang doors that do not operate freely.
 3. Adjust closers for full closure.
- C. Non-conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items.
1. Finish touch-up damaged surface finishes.
 2. Replace damaged materials or items with New if repair is not acceptable to Architect.
- 3.05 **CLEANING**
- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
- 3.06 **PROTECTION**
- A. Protect installed work from subsequent construction operations until date of Final Completion or Owner Occupancy, whichever occurs first.
- 3.07 **ADJUSTING**
- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

SECTION 08 31 00

ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following work:
 - 1. Wall access door and frame units, non-rated and fire rated.
 - 2. Ceiling access door and frame units, non-rated and fire rated.
 - 3. Access door to flat roof for service
- B. Doors required to provide access to concealed valves, gauges, and other equipment related to Fire Protection, Plumbing, HVAC, and Electrical Trade Contract work shall be provided by the respective Trade Contractors to Section 06 20 00 - Finish Carpentry for installation. Trade Contractors shall provide all access doors required by their work - whether doors are shown in the documents or not.
- C. Access doors required for purposes other than access to Fire Protection, Plumbing, HVAC, or Electrical Trade Contract work, and specifically shown on the architectural drawings shall be provided by this section for installation by Section 06 20 00 - Finish Carpentry.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 04 20 00 - Unit Masonry: Openings in masonry.
 - 2. Section 06 20 00- Finish Carpentry : Installation.
 - 3. Section 09 21 16-Gypsum Board Assemblies : Openings in gypsum wall board partitions and ceilings.
 - 4. Section 09 90 00 - Painting: Field paint finish.
 - 5. Division 21 - Fire Protection sections: Fire Protection valves and items requiring access.
 - 6. Division 22 - Plumbing sections: Plumbing valves and items requiring access.
 - 7. Division 23 - HVAC sections: Mechanical components requiring access.
 - 8. Division 26 - Electrical sections: Electrical components requiring access.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. UL. Underwriters Laboratories Inc.; www.ul.org.
 - a. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..

1.04 SUBMITTALS

- A. Construction Submittals:
 - 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - 2. Product Data: Indicate sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
 - 3. Shop Drawings: Indicate exact position of all access door units.
 - 4. Manufacturer's Installation Instructions: Indicate installation requirements.
- B. Closeout Submittals:

- a. Submittal Procedures: Section 01 78 00 - Closeout Submittals, for submittal procedures.
- b. Project Record Drawings: Record dimensioned locations of each unit installed on record drawings.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination per Section 01 31 14 and the following:
- B. Trade Contractors shall coordinate the location and size of required access panels with Sections 04 20 00 - Unit Masonry, Section 09 21 16 - Gypsum Board Assemblies to assure that rough openings are located appropriately.
- C. Coordinate installation of access panels with Section 06 20 00 - Finish Carpentry.

1.06 QUALITY ASSURANCE

- A. Single Source Responsibility: Furnish system materials from one manufacturer for entire Project unless otherwise acceptable to Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, and Section 01 60 00.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer / Product: Milcor by Commercial Products Group of Hart & Cooley, Inc.: www.milcorinc.com / Style M for Non-Fire-rated and Style UFR for insulated fire-rated, or an Architect acceptable equivalent subject to compliance with requirements from one of the following manufacturers:
 - 1. Larsen's Manufacturing Company: www.larsensmfg.com.
 - 2. Nystrom Building Products: www.nystrom.com.
 - 3. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.

2.02 WALL AND CEILING UNITS

- A. Non-Fire Rated Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
 - 1. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
 - 2. Door Style: Single thickness with rolled or turned in edges.
 - 3. Frames: 16 gage, 0.0598 inch, minimum.
 - 4. Heavy Duty Single Thickness Steel Door Panels: 14 gage, 0.0747 inch, minimum.
- B. Units in Fire Rated Assemblies: Fire rating as required by applicable code for the fire rated assembly in which they are to be installed.
 - 1. Material: Steel, hot-dipped galvanized or zinc aluminum alloy coated.
 - 2. Provide products listed and labeled by UL as suitable for the purpose specified and indicated.
 - 3. Rated door panels: 0.0359 inch double sheet with integral non-combustible insulation filler.
 - 4. Door Style: Single thickness 16 gage minimum thickness, or double thickness hollow construction with insulation, as required by fire rating.
 - 5. Frames: 16 gage, 0.0598 inch, minimum.
- C. Sizes:
 - 1. Provide sizes as indicated or required by HVAC, Plumbing, Fire Protection, and Electrical sections of the specification, and distance from access door to item requiring access.
 - 2. Walls: Minimum 16 x 16 inches, unless otherwise scheduled or acceptable to the Architect.

3. Ceilings: Minimum 16 x 16 inches, unless otherwise scheduled or acceptable to the Architect.
 4. Exterior access to flat roof to be 30" x 30" insulated unit
- D. Hardware:
1. Hardware for Fire Rated Units: As required for listing.
 2. Hinges for Non-Fire-Rated Units: Except as noted otherwise herein, Concealed, constant force closure spring type.
 3. Handle: Fixed.
 4. Latch/Lock: Except as noted as otherwise herein, cylinder lock operated cam latch, two keys for each unit. US 32D finish.
 - a. All cylinder locks provided on access doors for the project shall be keyed alike.
 5. Number of Locks/Latches Required: As recommended by the manufacturer for the size of the unit.
- E. Finish:
1. Access Door Units: Factory baked-on primer for field finish by Section 09 90 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
1. Verify that opening field measurements, surfaces, substrates, structural support, utility connections, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - a. Verify existing conditions before starting work.
 - b. Verify that opening sizes and tolerances are acceptable.
 2. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

- A. Access Door and Frame Units furnished to Section 06 20 00 for installation in accordance with manufacturer's instructions, UL requirements, approved submittals, the Drawings, and as follows:
1. Install units in accordance with manufacturer's instructions.
 2. Install frames plumb and level in openings. Secure rigidly in place.
 3. Position units to provide convenient access to the concealed work requiring access.

3.03 FIELD QUALITY CONTROL

- A. Non-conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items.
1. Finish touch-up damaged surface finishes.
 2. Replace damaged materials or items with New if repair is not acceptable to Architect.

3.04 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

3.05 PROTECTION

- A. Protect installed work from subsequent construction operations until date of Final Completion or Owner Occupancy, whichever occurs first.

END OF SECTION

SECTION 08 43 13

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, erecting and installing as specified, as scheduled, and as shown in the contract drawings, the following:
 - 1. Aluminum doors with vision glass within storefront framing.
 - 2. Glass and Glazing for vision panels as specified in Section 08 80 00
 - 3. Weatherstripping and astragal seals integral to doors and opening framing.
 - 4. Accessories as needed for a complete installation.
 - 5. Provision and installation of sealants at locations that will be inaccessible to the joint sealants subcontractor once storefront is installed, including, but not limited to sealant beds placed under door sills or storefront sill framing.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Section 08 71 00 - Door Hardware

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the Work of this Section, or with which the Metal Windows subcontractor must coordinate the work of this section include the following:
 - 1. Section 06 10 00 - Rough Carpentry: Rough opening framing, and wood perimeter blocking.
 - 2. Section 07 25 00 - Weather Barriers: Perimeter air and vapor seal between glazing system and adjacent construction.
 - 3. Section 07 90 05 - Joint Sealers: Perimeter sealant and back-up materials.
 - 4. Section 08 44 13 - Glazed Aluminum Curtainwall: Interface of the work of this section with exterior curtainwall systems.
 - 5. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.
 - 6. Section 08 80 00 - Glazing: Glass and glazing accessories.
 - 7. Section 09 21 00 - Gypsum Board Assemblies: Interior gypsum board wall finishes and framing, exterior sheathing.
 - 8. Section 09 30 00 - Tile: Tile floor and wall finishes at the building interior.
 - 9. Section 09 65 00 - Resilient Flooring: Floor finishes at the building interior.
 - 10. Section 09 68 13 - Tile Carpeting: Floor finishes at the building interior.
 - 11. Section 12 21 13 - Horizontal Louver Blinds: Attachments to framing members.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following
 - 1. AAMA. American Architectural Manufacturers Association; www.aamanet.org
 - a. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
 - b. AAMA 800 - Voluntary Specifications and Test Methods for Sealants
 - c. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site

- d. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - e. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
 - f. AAMA / WDMA / CSA 101 / I.S.2 / A440, NAFS -- North American Fenestration Standard/Specification for windows, doors, and skylights
2. ASCE. American Society of Civil Engineers; www.asce.org
 - a. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers.
 3. ASTM. ASTM International; www.astm.org
 - a. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - b. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - c. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - d. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
 - e. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - f. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - g. ASTM E2112, Standard Practice for Installation of Exterior Windows, Doors and Skylights
 4. NFPA. National Fire Protection Association; www.nfpa.org
 5. SSPC. The Society for Protective Coatings; www.sspc.org/standards/scopes.html
 - a. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Refer to Section 01 31 00 - Administrative Requirements, and the following:
 1. Coordination per Section 01 31 14, and as follows:
 - a. The Metal Windows subcontractor shall fully coordinate the work of this section with the following related sections:
 - 1) Section 08 71 00 - Door Hardware.
 - 2) Section 08 80 00 - Glazing
 2. Preinstallation Meetings: See Section 01 7000
 - a. Provide for manufacturer representation to conduct pre-installation site meeting.
 3. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

- A. Construction Submittals
 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 2. Product Data: Provide manufacturer's product data, component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, weather stripping gaskets, and installation instructions, use limitations and recommendations, and sample warranties applicable to this section.
 3. Shop Drawings: Submit drawings for review indicating location in plan and elevation, components with material types and description, sizes and dimensions including R.O. frame and extrusion, methods of joining,

details of all field connections and anchorage, fastening and sealing methods, and metal finishes.

- a. Details of field connections shall be specific to this project, and reflect the actual configuration of adjacent construction and materials. Generic manufacturer catalog details are not permissible as shop drawings and will be rejected without review.
 4. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
 5. Samples: Submit three representative samples of storefront and door: metal, fasteners, anchors, frame sections, mullion section, and corner section, for approval. In addition, provide three samples of each specified color on aluminum.
 6. Test and Evaluation Reports: Provide test reports from accredited laboratories certifying the performance as specified.
 - a. Test reports shall be accompanied by the window manufacturer's letter of certification, stating the tested window meets or exceeds the referenced criteria for the appropriate storefront type.
- B. Closeout Submittals
1. Submittal Procedures: Submit in accordance with Section 01 78 00.
 - a. Warranty Documentation: Executed warranties.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum ten years of experience.
- B. Single Source Responsibility: Furnish storefront system materials, including window and aluminum door and frame products installed in storefront from one manufacturer for entire Project, unless otherwise acceptable to Architect

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10, manufacturer instructions and recommendations, and Section 01 60 00.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 WARRANTY

- A. Special Warranty: Prepare and submit warranties in accordance with Section 01 78 00.
 1. Storefront System Warranty: General Contractor shall assume full responsibility and warrant for three years the satisfactory performance of the total storefront installation. This includes but is not limited to, glass, glazing, doors and hardware, anchorage and setting system, sealing, flashing as it relates to air, water, and structural adequacy as called for by the drawings, specifications, and approved submittals.
 - a. Any deficiencies due to such elements not meeting the requirements of the specification shall be corrected during the warranty period.
 2. Finish Warranty: Provide manufacturer warranty against excessive degradation of exterior finish based on specified AAMA requirements for a period of not less than 20 years. Warranty shall be signed by manufacturer and state that the paint system provided meets the requirements and description of the AAMA standard specified. Include provision for replacement of units if fading exceeds a 5-E color difference, cracking, peeling, chalking, or flaking.
 3. Glass Warranty Period: Refer to requirements in Section 08 80 00 - Glazing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer / Product: EFCO Corporation, #402-NT storefront framing or an Architect acceptable equivalent subject to compliance with requirements from one of the following manufacturers:
 1. Kawneer North America: www.kawneer.com.

2. Tubelite, Inc: www.tubeliteinc.com.
3. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00

2.02 PERFORMANCE REQUIREMENTS:

- A. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

2.03 ENTRANCE COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, factory finished.
 1. Framing members for interior applications need not be thermally broken.
 2. Glazing stops: Flush.
- B. Interior Doors: Glazed aluminum, wide style entrance door system from same manufacturer as storefront and curtain wall systems.
 1. Basis of Design: EFCO Corp., D500/D502 Series or other acceptable product from manufacturers listed above.
 2. Dimensions: the following dimensions are nominal, and may vary slightly by manufacturer:
 - a. Thickness: 1-3/4 inches.
 - b. Top Rail: 5 inches wide.
 - c. Vertical Stiles: 5 inches wide.
 - d. Bottom Rail: 10 inches wide.
 - e. Cross Rail: As indicated in drawings.
 3. Glazing Stops: Square, 0.05 inches thick.
 4. Corners shall be welded construction.
 5. Stile and Rail framing shall be 0.125 inches thick.
 6. Finish: Same as storefront.
 7. Provide EPDM glazing gaskets and glazing blocks and stops appropriate to glass thickness.

2.04 MATERIALS

- A. Extruded Aluminum: Shall be 6063-T6 alloy and temper per ASTM B221 (ASTM B221M).
- B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
- C. Fasteners: Stainless steel.
- D. Exposed Flashings and closure pieces: 0.032 inch thick aluminum sheet, factory formed to profiles needed; finish to match framing members.
- E. Fasteners: All exposed fasteners shall be aluminum or stainless steel.
- F. Perimeter Sealant: as specified in Section 07 90 05
- G. Glass: As specified in Section 08 80 00.
- H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- I. Glazing Accessories: As specified in Section 08 80 00.
- J. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.
- K. Dissimilar Metals: All dissimilar metals shall be properly isolated to prevent galvanic action.

2.05 FINISHES

- A. High Performance Organic Coating System: AAMA 2605 three (3) coat 70% PVDF, thermally cured polyvinylidene fluoride system.

1. Custom color to match color of aluminum clad wood windows; Marvin Windows "Hampton Sage".
- B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.06 HARDWARE

- A. Door Hardware: As specified in Section 08 71 00, with the following exceptions:
 1. For each door, include butt hinges, pivots, push handle, pull handle, exit device, narrow stile handle latch, and closer.
 - a. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
 - b. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

2.07 FABRICATION

- A. General:
 1. All aluminum frame extrusions shall have a minimum wall thickness of 0.080 inch (2 mm).
 2. All exposed work shall be carefully matched to produce continuity of line and design with all joints. System design shall be such that raw edges will not be visible at joints.
 3. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
 4. Accurately fit and secure joints and corners. Make joints flush, with hairline tolerance.
 5. Prepare components to receive anchor devices. Fabricate anchors.
 6. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 7. Arrange fasteners and attachments to conceal from view.
 8. Reinforce components internally for door hardware .
 9. Reinforce framing members for imposed loads.
 10. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
 - a. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
- B. Frame: Frame components shall be center glazed screw spline construction.
- C. Glazing: All units shall be "dry glazed" with recyclable EPDM gasket on both exterior and interior.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
- B. Carefully examine openings and installation areas with Installer present, for compliance with requirements affecting Work performance.
 1. Verify that field measurements, surfaces, substrates, structural anchoring support, tolerances, levelness, plumbness, cleanliness and other conditions are satisfactory and ready to receive Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install using only skilled tradesmen to install in accordance with ASTM E 2112, manufacturer's instructions, recommendations, approved submittals, the Drawings, and as follows:
 1. Storefront system shall be erected plumb and true, in proper alignment and relation to established lines and grades.
 2. Entrance doors shall be securely anchored in place to a straight, plumb, and level condition, without distortion and free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
 - a. Hardware movement shall be checked and final adjustments made for proper operation and

performance of units.

3. Furnish and apply sealing materials where embedded behind or under storefront framing members or door sills, or wherever sealant installation must occur simultaneous with framing installation due to sequence of installation.
 - a. Provide sealing materials as specified in Section 07 90 05 and manufacturer's requirements.
 - b. Sealing materials specified shall be used in strict accordance with the manufacturer's printed instructions, and shall be applied only by mechanics specially trained or experienced in their use.
 - 1) All surfaces must be clean and free of foreign matter before applying sealing materials.
 - 2) Sealing compounds shall be tooled to fill the joint and provide a smooth finished surface.
4. Set thresholds in bed of mastic and secure.
5. Install glass and infill panels in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.
6. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 FIELD QUALITY CONTROL

- A. Field Tests and Inspections the as follows:
 1. Inspect to verify that each storefront system is dimensionally within allowable tolerances, plumb, level, clean, with a solid anchoring surface, optimal operating components, and is in accordance with approved shop drawings.
 2. The Architectural Hardware Consultant shall evaluate each storefront door in opening with General Contractor and recommend adjustments to assure proper working order prior to Substantial Completion inspection.
 - a. Adjust doors for smooth and balanced door movement.
 - b. Rehang doors that do not operate freely.
 - c. Adjust closers for full closure.
- B. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items.
 1. Finish touch-up damaged surface finishes.
 2. Replace damaged material components or whole units with New if repair not acceptable to Owner or Architect.

3.04 ADJUSTING

- A. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.
- B. Adjust operable doors to a smooth operational performance and ease of latching.

3.05 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal
 1. Remove protective material from pre-finished aluminum surfaces.
 2. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
 3. Remove excess sealant by method acceptable to sealant manufacturer, and that meets LEED VOC /HAP requirements.

3.06 PROTECTION

- A. Protect installed work from damage during subsequent construction operations until date of Final Completion or Owner Occupancy, whichever occurs first..

END OF SECTION

SECTION 08 52 13

CLAD WOOD WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, erecting and installing the following clad wood windows:
 - 1. Aluminum clad wood windows complete with operating hardware and glazing, and weather strip,
 - 2. Insect screens.
 - 3. Simulated divided lites
 - 4. Applied mutton trim to resemble double hung divided rails
 - 5. Factory and field applied exterior panning trim and mull covers as detailed.
 - 6. Interior jamb extensions as detailed.
 - 7. Standard or specified anchors, trim, attachments, and accessories necessary for a complete installation.

1.02 RELATED SECTIONS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 06 10 00 - Rough Carpentry: blocking and grounds.
 - 2. Section 06 20 00 - Finish Carpentry: Wood trim other than furnished by window manufacturer.
 - 3. Section 07 90 05 - Joint Sealers: Secondary and cosmetic sealant at perimeter of openings, other than primary weather sealant installed by this contractor.
 - 4. Section 07 25 00 - Weather Barriers: Air and vapor barriers sealed to windows.
 - 5. Section 07 46 46 - Fiber Cement Siding: Trim around window units.
 - 6. Section 09 21 16 - Gypsum Board Systems: Exterior wall sheathing.
 - 7. Section 09 90 00 - Painting: Paint or stain other than factory applied finishes.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM International (ASTM):
 - a. E 283: Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
 - b. E 330: Standard Test Method for Structural Performance of Exterior Windows, Curtains Walls, and Doors by Uniform Static Air Pressure Difference.
 - c. E 547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
 - d. E 2190: Specification for Sealed Insulated Glass Units
 - e. C 1036: Standard Specification for Flat Glass.
 - 2. WDMA I.S.4: Industry Standard for Water Repellent Preservative Treatment for Millwork.

3. American Architectural Manufacturers Association / Window and Door Manufacturers Association (AAMA / WDMA):
 - a. ANSI / AAMA / NWWDA 101 / I.S.2-97 Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
 - b. 101 / I.S.2 / NAFS-02 Voluntary Performance Specification for Windows, Skylights and Glass Doors.
 - c. AAMA/WDMA/CSA 101/I.S.2/A440-05, Standard /Specification for Windows, Doors and Unit Skylights.
 - d. Window and Door Manufacturers Association (WMDA): 101 / I.S.2 WDMA Hallmark Certification Program.
 - e. Sealed Insulating Glass Manufacturers Association / Insulating Glass Certification Council (SIGMA / IGCC).
 - f. American Architectural Manufacturers Association (AAMA): 2605: Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
 - g. National Fenestration Rating Council (NFRC): 101: Procedure for Determining Fenestration Product Thermal Properties.

1.04 **SYSTEM DESCRIPTION**

A. Design and Performance Requirements:

1. Window units shall be designed to comply with ANSI / AAMA / NWWDA 101 / I.S.2-97 and 101 / I.S. 2/ NAFS-02.
2. Casement units: CW-PG-50C performance rating
3. Picture: CW-PG50-FW performance rating.
4. Air leakage shall not exceed the following when tested at 1.57 according to ASTM E 283: = 0.30 cfm per square foot of frame.
5. No water penetration shall occur when units are tested at the following pressure according to ASTM E 547: (H-LC40 - 6.0) (H-LC30 - 4.5) (F-C40-6.0) (TR-C40-6.0) psf.
6. Window assembly shall withstand the following positive or negative uniform static air pressure difference without damage when tested according to ASTM E 330: (H-LC40 – 60) (H-LC30 – 45)(F-C40-60) (TR-C40-60) psf.

1.05 **SUBMITTALS**

A. Construction Submittals:

1. Submit in accordance with Section 01 30 00.
2. Shop Drawings: Submit shop drawings of window assemblies and installation conditions. Shop drawings shall include accurate representation of windows, trim, surrounding wall construction, blocking, sealants, etc. Manufacturer's generic details of window units are not acceptable and will be rejected.
 - a. Schedule window types using the same or similar codes as used in the design documents.
3. Product Data: Submit catalog data for specified window unit types, including physical and thermal performance specifications, glazing type, low-E coatings, etc.
4. Samples:
 - a. Submit corner section of most common type of window unit, complete with glass, frame, divided lite trim, glass, panning trim, and sill.
 - 1) Include glazing system, quality of construction, and specified finish.
 - b. Submit (3) three samples of each color to be used, of specified paint system, prepared on metal substrate.

5. Certificates: Submit manufacturer's certifications indicating compliance with specified performance and design requirements.

1.06 **QUALITY ASSURANCE**

- A. Building Envelope Commissioning will be provided for this project by the Owner. This subcontractor shall cooperate fully with the Building Commissioning Agent to provide access for testing of installed materials, and to repair or remediate conditions identified by the Building Commissioning Agent in order to obtain his acceptance of installed work.
 1. Testing to be performed by the Owner's Testing Agent and the Building Commissioning Agent will include:
 - a. Air infiltration testing in accordance with ASTM E783.
 - b. Water Infiltration testing in accordance with ASTM E1105.
 - c. A minimum of 5% of windows shall be tested, to be sampled at approximately 10%, 50%, and 75% completion of window installation.
 - d. Windows that fail testing shall be retested at no additional expense to the Owner.
 - e. This subcontractor and the General Contractor shall anticipate three full days of testing and dedicate labor in the quantity needed to assist the Commissioning Agent with and complete the testing.

1.07 **MOCK UP**

- A. The project scope includes a stand-alone mock-up assembly representative of the exterior envelope of the building, and includes the Work of this section. The mock-up shall include wall and roof components including (but not limited to) cold-formed metal framing, sheathing, insulation, brick masonry veneer, pre-cast architectural concrete, windows, roof edge and coping, and other components of the exterior envelope as described in Section 01 40 00 - Quality Requirements, to remain in place for the duration of the Project.
- B. The pertinent contractors and subcontractors shall erect the Mock-Up assembly for review by the Architect and Owner, and all corrective actions and replacement of unsatisfactory work identified by the Architect completed by the Contractors and accepted as the standard for execution of the work and the materials proposed prior to commencement of the work on the building envelope.
- C. Following acceptance of submittals for material components and selection of colors provide materials of each color selected, installed in place on the mock up for final review by Architect prior to proceeding with the Work.
 1. Window units as indicated in mock up drawing detail, in approved paint finish color, and including flashing and sub-flashing materials as detailed.
 - a. Perimeter joint sealants in specified colors.
 2. Do not start masonry work until mock-ups are accepted by Owner and Architect.
 3. Accepted mock-ups will be used as standard of comparison of window installation and sealing to wall system.
 4. Modify and/or replace mock-ups as many times as necessary to obtain Architect's and Owner's approval.
- D. Do not destroy mock-up until directed.
- E. Locate mock-up where directed.
- F. Mock-up may not remain as part of the Work.

1.08 **DELIVERY**

- A. Comply with provisions of Section 01 65 00.
- B. Deliver in original packaging and protect from weather.

1.09 **STORAGE AND HANDLING**

- A. Prime or seal wood surfaces, including surface to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation.

- B. Store window units in an upright position in a clean and dry storage area above ground and protect from weather under provisions of Section 01 66 00.

1.10 WARRANTY

- A. Windows shall be warranted to be free from defects in manufacturing, materials, and workmanship for a period of ten (10) years from purchase date.
- B. Insulating glass shall be warranted against visible obstruction through the glass caused by a failure of the insulating glass air seal for a period of twenty (20) years from the date of original purchase.
- C. Finish Warranty: Provide manufacturer warranty against excessive degradation of exterior finish based on AAMA 2605. Include provision for replacement of units with excessive fading, chalking, or flaking. Warranty Period: Correct defective work within a twenty (20) year period after date of substantial completion.
- D. Windows may remain unfinished/ bare interior surface for up to four months with no negative impact to warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Pella Windows, Architect Series with Simulated Divided Lite Muntins
- B. Subject to meeting the requirements of this specification, acceptable manufacturers include:
 - 1. Kolbe & Kolbe; Ultra Series.
 - 2. Loewen; Double Hung Series 25.
 - 3. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.

2.02 FRAME DESCRIPTION

- A. Douglas fir finger jointed core with clear Douglas fir veneer.
 - 1. Kiln dried to a moisture content no greater than twelve (12) percent at the time of fabrication.
 - 2. Water repellent preservative treated in accordance with WDMA I.S.4.
- B. Frame thickness: 1 3/16 inch (30 mm).
- C. Frame width: 4-9/16 inches (116 mm). Exterior extruded aluminum clad 0.050 inch (1.3 mm) thick.

2.03 SASH DESCRIPTION

- A. Douglas fir:
 - 1. Kiln dried to a moisture content no greater than twelve (12) percent at the time of fabrication.
 - 2. Water repellent preservative treated in accordance with WDMA I.S.4.
- B. Composite sash thickness: 1-5/8 inches (41 mm) for operating units, 1-7/8 inches (48 mm) for stationary units. Corners slot and tenoned.
- C. Sash exterior extruded aluminum clad 0.050 inch (1.3 mm) thick.

2.04 GLAZING

- A. Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E 774.
- B. Glazing method: Insulated glass.
- C. Glass Types:
 - 1. Glazing for south and west-facing elevations, as indicated on drawings:
 - a. Window manufacturer's clear, Low-E3 366 or equivalent on #2 surface with Argon fill between lites.
 - 1) Visible Light Transmittance: 65%.

- 2) Solar Heat Gain Coefficient: .27.
- 3) U-Factor (winter): .24.
- 4) Ultraviolet transmittance: 5%.
- b. Provide insulating glass with tempered glass lites where safety glass is required by building code or as indicated on drawings.
- c. Provide obscured insulated glass of same Low-E formulation where indicated in drawings.
- d. Glazing for north and east-facing elevations, as indicated on drawings:
- e. a. Window manufacturer's clear, Low-E3 272 or equivalent on #2 surface with Argon fill between lites.
 - 1) Visible Light Transmittance: 72%.
 - 2) Solar Heat Gain Coefficient: .41.
 - 3) U-Factor (winter): .25.
 - 4) Ultraviolet transmittance: 16%.
- f. Provide insulating glass with tempered glass lites where safety glass is required by building code or as indicated on drawings.
- g. Provide obscured insulated glass of same Low-E formulation where indicated in drawings.
- D. Stainless steel spacer bars at edge of glass and SDL.
- E. Glazing seal: Silicone bedding on interior; acrylic foam adhesive tape on exterior.

2.05 **FINISH**

- A. Exterior: Superior Performance Organic Coating System: AAMA 2605, multiple coat, thermally cured 70% PVDF system.
 - 1. Color:
 - a. To be selected from manufacturer's full range of available standard and non-standard colors.
- B. Interior: Treated bare wood with clear finish.
 - 1. If window manufacturer does not offer factory applied clear finish, the General Contractor shall include the additional cost of site applied clear finish. The General Contractor shall coordinate with the window manufacturer to assure that interior finish is included at no additional cost to the project.

2.06 **HARDWARE**

- A. Locks: Multi-point sequential concealed locking system in the jamb opposite the hinge side for casement units. Lock handles are removable, non-handed. Keeper features a roller for reduce average lock force and does not easily disengage with the cam even under severe loading. Stainless steel packages are available for coastal application.
- B. Handles: Standard operating handle is a folding handle, zinc painted with the standard folding cover being molded plastic. Available colors: standard is Satin Taupe (painted), White (painted), Bronze (painted), Satin Chrome (plated), Satin Nickel (plated), Oil Rubbed Bronze (plated), Brass (plated), Antique Brass (plated)
- C. Hinges: One at the sill to bottom rail, one at the head jamb to top rail. Hinges are steel coated with E-Gard™. Hinge track is stainless steel. Unit with a frame OM of 20 inches (508mm) and greater use an 18 inch (457mm) wash/egress hinge to allow the sash to slide across the frame opening which causes the sash exterior to rotate towards the user for easy wash ability. Units under a frame OM of 20 inches (508mm)width use a standard 2 bar hinge which will position the sash when fully open to 90degrees for the user to wash but does not include the feature of sliding the sash across the opening and rotating the exterior towards the user.
- D. Optional Window Operating Control Device.
- E. Finish: Satin nickle

2.07 WEATHER STRIP

- A. Operating units: Continuous, leaf weather strip at head jamb parting stop; dual durometer bulb at check rail; foam bulb type dual durometer weather strip on vertical sash edge; dual durometer bulb weather-strip at bottom rail. Color: Beige.
- B. Stationary units: Continuous, bulb weather strip at perimeter of sash, concealed slotted bulb weather strip on exterior of sash, pile weather strip on interior of blind stop, dual durometer bulb weather strip at bottom rail. Color: Beige.
- C. Muller units: Any gaps between muller units shall be filled with low-rise foam. Manufacturer shall ensure that muller units pass envelope commissioning pressure testing.

2.08 JAMB EXTENSION

- A. Factory installed jamb extension for wall thickness indicated or required.
- B. Finish: Match interior finish.

2.09 INSECT SCREENS

- A. Crank Out
 - 1. Aluminum frame finish Stone White
 - 2. Screen mesh: Charcoal Aluminum Wire

2.10 SIMULATED DIVIDED LITES (SDL)

- A. 7/8 inch (22 mm) wide; with stainless steel internal spacer bars with 1-15/16" horizontal bar to simulate appearance of sash.
 - 1. Exterior muntins: 0.055 inch (1.4 mm) thick extruded aluminum.
 - 2. Interior muntins: to match sash and frame
- B. Pattern: Rectangular; layout as indicated in drawings.
- C. Finish: Match sash finish.

2.11 ACCESSORIES AND TRIM

- A. Installation Accessories:
 - 1. Installation brackets: to fit conditions indicated in drawings..
 - 2. Masonry brackets: size as needed to fit wall conditions indicated in drawings.
 - 3. Sash lifts: High pressure zinc die-cast. Color: Satin Taupe baked enamel.
 - 4. Aluminum Extrusions:
 - a. Mull covers as required for incorporation of structural wall framing between units and to provide a weather tight unit with continuous appearance.
 - b. Finish: Superior Performance Organic Coating System: AAMA 2605, multiple coat, thermally cured 70% PVDF system.
 - 1) Custom color, to match window frame.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Before Installation, verify openings are plumb, square, and of proper dimension as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General Contractor before proceeding.
- B. Acceptance of Conditions: Beginning of installation confirms acceptance of existing conditions.

3.02 INSTALLATION

- A. Comply with Section 01 70 00.
- B. Assemble and install window unit according to manufacturer's instructions and reviewed shop drawings.

- C. Verify units are plumb, square and level within openings.
- D. Install primary sealant and related backing materials at exterior weatherproof joint at perimeter of unit or assembly in accordance with Section 07 92 00 - Joint Sealers. Do not use expansive foam sealant.
- E. Install accessory items as required to provide a complete installation.

3.03 **CLEANING**

- A. Remove visible labels and adhesive residue from glass according to manufacturer's instructions.
- B. Leave windows and glass in a clean condition. Final cleaning as required in Section 01 74 00.

3.04 **PROTECTING INSTALLED CONSTRUCTION**

- A. Comply with Section 01 76 00.
- B. Protect windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage.

END OF SECTION

SECTION 08 71 00

FINISH HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes
 - 1. Furnish and deliver all finish hardware necessary for all doors, also hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware.
- B. Related Sections
 - 1. Division 6 Section - Finish Carpentry
 - 2. Division 8 Section - Hollow Metal Doors and Frames
 - 3. Division 8 Section - Wood Doors
 - 4. Division 8 Section – Aluminum Framed Storefronts
 - 5. Division 26 Section - Electrical
- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:
 - 1. Windows
 - 2. Toilet accessories of all kinds including coat hooks.

1.03 REFERENCES

- A. Applicable state and local building codes.
- B. FIRE/LIFE SAFETY
 - 1. NFPA - National Fire Protection Association
 - 2. NFPA 70 – National Electric Code

3. NFPA 80 - Standard for Fire Doors and Fire Windows
 4. NFPA 101 - Life Safety Code
 5. Code of Massachusetts Regulations, 9th edition, 780 CMR.
- C. UL - Underwriters Laboratories
1. UL 10B - Fire Tests of Door Assemblies
 2. UL 10C – Positive Pressure Test of Fire Door Assemblies
 3. UL 305 - Panic Hardware
- D. ACCESSIBILITY
1. ICC (CABO) / ANSI A117.1 - Accessible and Usable Buildings and Facilities
 2. ADA - Americans with Disabilities Act - Plus State Amendments
 3. Code of Massachusetts Regulations, 8th edition, 780 CMR 11, Massachusetts Architectural Access Board's Rules & Regulations, 521 CMR 1.00.
- E. DHI - Door and Hardware Institute
1. Sequence and Format for the Hardware Schedule
 2. Recommended Locations for Builders Hardware
- F. ANSI - American National Standards Institute
1. ANSI/BHMA A156.1 - A156.24 - Standards for Hardware and Specialties

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 requirements.
- B. Catalog Cuts: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Final Hardware Schedule Content: Organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
1. Type, style, function, size, and finish of each hardware item.
 2. Name and manufacturer of each item.
 3. Fastenings and other pertinent information.
 4. Location of each hardware set cross-referenced to indications on Drawings.
 5. Explanation of all abbreviations, symbols, and codes contained in schedule.

6. Mounting locations for hardware.
 7. Door and frame sizes and materials.
 8. Name and phone number for the local manufacturer's representative for each product.
- D. Key Schedule: After a keying meeting between representatives of the Owner, Architect, hardware supplier, and, if requested, the representative for the lock manufacturer, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled.
- E. Samples: If requested by the Architect, submit samples of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.
1. Samples will be returned to the supplier in like-new condition. Units that are acceptable to the Architect may, after final check of operations, be incorporated into the Work, within limitations of key coordination requirements.
- F. Templates: After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware.
- G. Wiring Diagrams: After final approval of the hardware schedule, submit wiring diagrams as required for the proper installation of all electrical, electromechanical, and electromagnetic products.

1.05 QUALITY ASSURANCE

- A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials. Requests for substitutions must be made in accordance with Division 1 requirements. If proposing a substitute product, submit product data for the proposed item with product data for the specified item and indicate basis for substitution and savings to be made. Provide sample if requested. Certain products have been selected for their unique characteristics and particular project suitability.
1. Items specified as "no substitution" shall be provided exactly as listed.
 2. Items listed with no substitute manufacturers listed have been requested by the Owner or Architect to match existing for continuity and/or future performance and maintenance standards or because there is no known equal product.
 3. If no other products are listed in a category, then "no substitution" is implied.
- B. Supplier Qualifications: A recognized architectural hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an accredited Architectural Hardware Consultant (AHC), who is available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.
- C. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwrites Laboratories, Intertek Testing Services, Factory Mutual, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
- E. Electronic Security Hardware: When electrified hardware is included in the hardware specification, the hardware supplier must employ an individual knowledgeable in electrified components and systems, who is capable of producing wiring diagrams and consulting as needed. Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and technical data to the Architect and other related subcontractors. Upon

completion of electronic security hardware installation, inspect and verify that all components are working properly.

- F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
1. Function of building, flow of traffic, purpose of each area, and degree of security required.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Address for delivery of keys.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 2. Review sequence of operation for each type of electrified door hardware.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review required testing, inspecting, and certifying procedures.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Tag each item or package separately with identification related to the final hardware schedule, and include installation instructions with each item or package.
- B. Each article of hardware shall be individually packaged in manufacturer's original container.
- C. Contractor will provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses.
- D. Items damaged in shipment shall be replaced promptly and with proper material and paid for by whomever did the damage or caused the damage to occur.
- E. All hardware shall be handled in a manner to avoid damage, marring, or scratching. Any irregularities that occur to the hardware after it has been delivered to the Project shall be corrected, replaced, or repaired by the Contractor. All hardware shall be protected against malfunction due to paint, solvent, cleanser, or any chemical agent.

1.07 WARRANTY

- A. Provide manufacturer's warranties as specified in Division 01 and as follows:
1. Closers: 10 years
 2. Exit Devices: 3 years
 3. Mortise Locks: 3 years
 4. All other hardware: 1 year
- B. No liability is to be assumed where damage or faulty operation is due to improper installation, improper use, or abuse.
- C. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer's warranty, at no additional cost to the Owner.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PROJECT CONDITIONS

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical as the same operation and quality as type specified, subject to Architect's approval.
- B. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including size, strike plate size, quantities, and sill conditions material. If conflict between the scheduled material and existing conditions, submit request for directions from Architect.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The Awarding Authority has determined that certain products should be selected for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute" (NO OTHER PRODUCTS WILL BE CONSIDERED FOR THOSE LISTED IN PROJECTS DOCUMENTS.)
- B. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.05.A.
- C. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

<i>Item</i>	<i>Scheduled Manufacturer</i>	<i>Acceptable Substitute</i>
Hinges	IVES (IVE)	McKinney, Hager, Stanley
Continuous Hinges	IVES (IVE)	Markar, Stanley, McKinney
Locksets & Deadlocks	Schlage (SCH)	Best, Sargent
Cylinders & Keying	Schlage (SCH)	Best, Sargent
Electrified Locks and Trim	Schlage (SCE), Von Duprin (VON)	Best, Sargent
Exit Devices & Mullions	Von Duprin	Precision, Sargent
Door Closers	LCN (LCN)	Sargent, Norton, Yale
Electro-Mechanical Automatic Operators	LCN (LCN)	Besam, Horton
Push & Pull Plates & Bars	Ives (IVE)	Hager, Burns, Rockwood
Flush Bolts & Coordinators	Ives (IVE)	Hager, Burns, Rockwood
Protection Plates	Ives (IVE)	Hager, Burns, Rockwood
Stops & Holders	Ives (IVE)	Hager, Burns, Rockwood
Silencers	Ives (IVE)	Hager, Rockwood
Thresholds	Zero (ZERO)	National Guard, Reese, Pemko
Weatherstrip	Zero (ZERO)	National Guard, Reese, Pemko
Key Safe	Knox	-

- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

2.02 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely.
4. All hardware shall be installed with the fasteners provided by the hardware manufacturer.

B. Hinges

1. The following is a guide for hinge type required for this specification:
 - a. 1 3/4" thick doors up to and including 3'-0" wide:
exterior: standard weight, ball bearing, bronze/stainless steel, 4 1/2" high
interior: standard weight, ball bearing, steel, 4 1/2" high
 - b. 1 3/4" thick doors over 3'-0" wide:
exterior: heavy weight, ball bearing, bronze/stainless steel, 5" high
interior: heavy weight, ball bearing, steel, 5" high
2. Provide 3 hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Interior Doors: Non-rising pins
4. The width of hinges shall be 4 1/2" or as required for clearance.

C. Continuous Hinges

1. Provide continuous hinges, where specified in the hardware sets, fabricated from 6063-T5 aluminum, with .25 inch diameter Teflon coated stainless steel hinge pin.
2. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
3. Hinges shall be capable of supporting door weights up to 600 pounds, and shall be successfully tested for 1,500,000 cycles.
4. On fire-rated doors, provide continuous hinges that are classified for use on rated doors by a testing agency acceptable to the authority having jurisdiction.

5. Provide continuous hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware.
6. Install hinges with fasteners supplied by manufacturer. Hole pattern shall be symmetrically patterned.
7. Acceptable manufacturers and/or products: Markar, McKinney, Stanley.

D. Flush Bolts

1. Automatic and manual flush bolts shall have forged bronze face plates with extruded brass levers and with wrought brass guides and strikes. Flush bolts for hollow metal doors shall be extension rod type, and wood doors shall have corner-wrap type. Hollow metal doors up to 7'-6" in height shall have 12" steel or brass rods. Manual flush bolts for doors over 7'-6" in height shall be increased by 6" for each additional 6" of door height. Provide dust-proof strikes where scheduled.

E. Coordinators

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide a bar-type coordinating device, surface applied to the underside of the stop at the frame head.
2. Provide a filler bar of the correct length for the unit to span the entire width of the opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

F. Mortise Locks

1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing without opening the case. Cylinders: Refer to 2.04 KEYING.
2. Provide locks with a standard 2-3/4 inches backset with a full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1 inch throw, constructed of stainless steel.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
4. Provide electrical options as scheduled. Provide electrified locksets with micro switch (RX) option that monitors the retractor crank, and is actuated when rotation of the inside or outside lever rotates the retractor hub. Provide normally closed contacts or normally open contacts as required by security system.
5. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle.
 - a. Lever design shall be Schlage 17A.
 - b. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
6. Acceptable manufacturers and/or products: Schlage L9000 series, Best 45H series, Sargent 8200 series.

G. Exit Devices

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware. Cylinders: Refer to 2.04 KEYING.
2. Exit devices shall be touchpad type, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.

3. Touchpad shall extend a minimum of one half of the door width. Touch-pad finish shall be compatible to exit device finish. Compression springs will be used in devices, latches, and outside trims or controls, tension springs also acceptable.
4. Devices to incorporate a deadlatching feature for security and/or for future addition of alarm kits and/or other electrical requirements.
5. Provide manufacturer's standard strikes.
6. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.
7. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
8. Non-fire-rated exit devices shall have cylinder dogging.
9. Removable mullions shall be a 2 inches x 3 inches steel tube. Where scheduled, mullion shall be of a type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
 - a. Lever style will match the lever style of the locksets.
 - b. Lever trim on doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
11. Exit devices for fire rated openings shall be UL labeled fire exit hardware.
12. Provide electrical options as scheduled.
13. Acceptable manufacturers and/or products: Von Duprin 99/33 series, Precision Apex series, Sargent 80 series with deadlatching

H. Door Closers

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Pressure Relief Valve (PRV) Technology: Not permitted.

8. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
9. Door closers meeting this specification: LCN 4050 series, Norton 7500 series, Yale 4400 series, Sargent 351 series.

I. Electro-Mechanical Closer/holders

1. Provide single-point or multi-point hold-open electro-mechanical closer/holders as specified. Verify voltage with Electrical Contractor and provide a transformer if necessary.
2. Provide multi-point electro-mechanical closer/holders with swing free arms.
3. Provide hydraulic fluid of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
5. Provide drop plates, brackets, or adapters for arms as required for details.
6. Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
7. Closer/holders shall not incorporate Pressure Relief Valve (PRV) technology.
8. Acceptable manufacturers and/or products: LCN 4040SE/4310ME/4410ME

J. Electro-Mechanical Automatic Operators

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI A156.19 where automatic operators are specified.
2. The operator shall be powered with a DC motor working through reduction gears. Closing shall be spring force. No manual, hydraulic, or chain drive closer will be acceptable. The motor is to be off when the door is in closing mode. The door can be manually operated with the power on or off without damage to the operator. The operator shall include variable adjustments, including opening and closing speed adjustment. Operator shall be mounted in an aluminum cover.
3. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
4. Provide drop plates, brackets, or adapters for arms as required to suit details.
5. Provide hard-wired actuator switches for operation as specified. Actuators shall be weather-resistant type at exterior applications.
6. Provide key switches, with LED's, recommended and approved by the manufacturer of the automatic operator as required for the function as described in the operation description of the hardware sets. Cylinders: Refer to 2.04 KEYING.
7. Where automatic operators are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by the manufacturer of the automatic operator for each individual leaf. Actuators shall control both doors simultaneously at pairs. Exterior and vestibule doors with automatic operators shall be sequenced to allow ingress or egress through both sets of openings as directed by the Architect. Locate the actuators, key switches, and other controls as directed by the Architect.

8. Acceptable manufacturers and/or products: LCN Senior Swing, Besam Swingmaster MP, Horton 4000LE series.

K. Overhead Stops and Overhead Stop/holders

1. Provide heavy duty surface mounted overhead stop or overhead stop/holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy or medium duty and concealed or surface mounted overhead stop or overhead stop/holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking a wall, open against equipment, casework, sidelights, and/or where conditions do not allow a wall stop or a floor stop presents a tripping hazard.
3. Where overhead holders are specified provide friction type at doors without a closer and positive type at doors with a closer.
4. Acceptable manufacturers and/or products: Glynn-Johnson, Rixson, Sargent.

L. Protection Plates: Provide kick, mop, or armor plates as scheduled, with 4 beveled edges. Furnish with machine or wood screws, finished to match plates. Sizes of plates shall be as follows:

1. Kick Plates - 8" high x 2" LWOD on single doors, 1" LWOD on pairs
2. Mop Plates - 4" high x 2" LWOD on single doors, 1" LWOD on pairs
3. Armor Plates - 36" high x 2" LWOD on single doors, 1" LWOD on pairs

M. Door Stops and Holders

1. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements:
 - a. Wall stops shall be used wherever possible.
 - b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
 - c. At any opening where a wall or floor stop cannot be used, a heavy duty overhead stop must be used.

N. Thresholds and Weatherstrip: Furnish as scheduled and per architectural details. Match finish of other items as closely as possible. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available.

O. Silencers: "Push-in" type silencers for each hollow metal or wood frame, 3 for each single frame, 2 for each pair frame. Omit where gasketing is scheduled.

P. Key Safe: Recess mounted in new masonry wall in accordance with manufacturer's instructions, steel plate construction, UL listed, powder coat finish (Black) with stainless steel hinge and lock cover, coordinate lock with local Fire Department: Knox 3200.

2.03 FINISHES

- A. With the exception of all items listed below, the finish of all hardware shall be US26D Satin Chrome.
- B. Exceptions are as follows:

1. If different finish is listed for hardware in individual hardware sets.
2. Door Closers – aluminum power coat finish to match other hardware at opening.
3. Weatherstripping – clear anodized aluminum
4. Thresholds – mill finish aluminum
4. Silencers - grey

2.04 KEYING

- A. Provide a new high security restricted patented keying system. Keyed into New Schlage Everest 29 T FSIC (Full Size Interchangeable Core) keying system conforming to the following requirements:
1. Provide high security restricted patented removable core cylinders at all keyed devices. High security cores shall incorporate a double-locking feature through the use of a side bar or second set of pins. Restricted shall control the access to the products by requiring a signed letter of authorization and/or authorization form from the Owner or authorized agent of the Owner. Patent shall protect against the unauthorized manufacturing and duplication of the products. High security restricted patented cores shall not be operable by non-patented key blanks and will not be allowed if they can be compromised by removing material from the manufacturers non-patented key blank. High security restricted patented cores shall incorporate a mechanism to check for the patented features on the keys. Provide construction cores with construction master keying for use during construction. The hardware supplier, accompanied by the Owner or Owner's security agent, shall install permanent keyed cores upon completion of the project. The temporary construction cores are to be returned to the hardware supplier.
 2. Provide permanent cores and cylinders keyed by the manufacturer or authorized distributor as directed by the Owner. Provide owner with a copy of the biting list, return receipt requested.
 3. The hardware supplier, accompanied by a qualified factory representative for the manufacturer of the cores and cylinders, shall meet with Owner and Architect to review keying requirements and lock functions prior to ordering finish hardware. Submit a keying schedule to Architect for approval.
 4. Provide cores and cylinders, unless noted otherwise, operated by a Grand Master Key System to be established for this project (Do not use the letter "I", "O", or "X" for any of the grand masters). Allow for eight Master Keys under each Grand Master, and sixty-four changes under each master key. All cylinders shall be keyed in alike or different sets as noted by their respective key set number. Do not use the letter "I" or "O" in any of the master key sets.
 5. All cylinders shall be keyed in alike or different sets as noted by their respective key set number. Do not use the letter "I" or "O" in the master key set.
 6. Provide patented restricted keys as follows:
 - a. Six grand master keys for each set.
 - b. Ten master keys for each set.
 - c. Three keys per core and/or cylinder.
 - d. Two construction core control keys
 - e. Two permanent core control keys
 - f. Six construction master keys for each type (Contractor is to provide one set of construction keys to Architect)
 7. Visual key control:
 - a. Keys shall be stamped with their respective key set number and stamped "DO NOT DUPLICATE".
 - b. Grand master and master keys shall be stamped with their respective key set letters.
 - c. Do not stamp any keys with the factory key change number.

- d. Do not stamp any cores with key set on face (front) of Core. Stamp on back or side of cores so not to be visible when core is in cylinder.
 - 8. Deliver grand master keys, master keys, change keys, and/or key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.
 - 9. Acceptable Manufacturers: Schlage Everest 29 T, Best CORMAX, Sargent DG2
- B. Provide Owner with 200 spare keyblanks matching new keyway.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of finish hardware. Correct all defects prior to proceeding with installation.

3.02 INSTALLATION

- A. Coordination:
 - 1. Prior to installation of hardware, schedule and hold a meeting for the purpose of instructing installers on proper installation and adjustment of finish hardware. Representatives of locks, exit devices, closers, automatic operators, and electrified hardware shall conduct training; provide at least 10 days notice to representatives. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.
 - 2. Prior to installation of electrified hardware, schedule and hold a meeting for the purpose of coordinating finish hardware with security, electrical, doors and frames, and other related suppliers. A representative of the supplier of finish hardware, and doors and frames, the electrical subcontractor, and the Owner's security contractor shall meet with the Owner, Architect, and General Contractor prior to ordering finish hardware. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.
- B. All hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer's rep for the item in question, as listed in the hardware schedule.
- C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- D. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.
- E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.
- F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- G. All operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.
- H. Existing Doors and/or Frames: Remove existing hardware being replaced, tag, and store according to contract documents. Field modify and prepare existing door and/or frame for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

3.03 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.
- B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.

3.04 FIELD QUALITY CONTROL

- A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of latchsets and locksets, door control devices, and of other major hardware suppliers, shall perform the following work:
 - 1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
 - 2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
 - 3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
 - 4. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.

3.05 PROTECTION

- A. Provide for the proper protection of all items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

3.06 HARDWARE SCHEDULE

- A. Provide hardware for each door to comply with requirements of Section "Finish Hardware," hardware set numbers indicated in the following schedule of hardware sets.
- B. It is intended that the following schedule includes complete items of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the preamble will be the deciding document.
- C. Locksets, exit devices, and other hardware items are referenced in the Hardware Sets for series, type, and function. Refer to the preamble for special features, options, cylinders/keying, and other requirements.

HARDWARE SET NO. 01

FOR USE ON DOOR #(S):

6@123, 7@101, 8@012

EACH TO HAVE:

2	EA	CONT. HINGE	112HD	IVE
2	EA	MANUAL FLUSH BOLT	FB458 OR FB358 AS REQUIRED	IVE
1	EA	DUST PROOF STRIKE	DP2	IVE
1	EA	MORTISE LOCK	MS-1850-S 1 1/8" BS	ADA
2	EA	CYLINDER	RIM OR MORTISE AS NEEDED	SCH
1	EA	EXIT INDICATOR	4089	ADA
2	EA	PUSH BAR	9100HD-NO	IVE
2	EA	LONG DOOR PULL	9266F 72" 56" STD	IVE
2	EA	SURFACE CLOSER	4050 REG OR EDA AS REQ.	LCN
1	EA	SURF. AUTO OPERATOR	9542 MS	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-853T	LCN
2	EA	SURFACE MOUNT BOX	8310-867S	LCN
1	EA	GASKETING	BY DOOR MANUFACTURER	BYO
2	EA	DOOR SWEEP	154A	ZER
1	EA	THRESHOLD	626A	ZER
2	EA	DOOR CONTACT	679-05HM	SCE
1	EA	REMAINING HARDWARE	BY DOOR MANUFACTURER	EXI

ALL WIRING AND CONNECTIONS BY ELECTRICAL SUBCONTRACTOR.

OPENING WITH AUTO OPERATOR. BOTH EXTERIOR AND INTERIOR PRESS WALL SWITCHES ALWAYS ACTIVE, EXCEPT ON RARE OCCASIONS WHEN DOORS HAVE FLUSH BOLTS AND DEADBOLT SECURING OPENING. OPENING NOT INTERCONNECTED WITH ANY OTHER OPENING. ASSUME THAT HINGES WILL NEED SPECIAL MOUNTING HOLE LOCATIONS FOR USE WITH EFCO FRAMING (EQUAL TO SELECT SL-12HD). CLOSER TO BE TOP JAMB MOUNTED.

HARDWARE SET NO. 02

FOR USE ON DOOR #(S):

10@123, 1@006, 1@007, 1@008, 1@106, 1@107, 1@119, 5@105, 1@104, 1@118, 1@001, 1@002, 1@009,

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	IVE
1	EA	STOREROOM LOCK	L9080R 17A	SCH
1	EA	SURFACE CLOSER	4050 REG OR EDA AS REQ.	LCN
1	EA	KICK PLATE	8400 2" LDW	IVE
1	EA	STOP	WS407CCV OR FS436/FS438	IVE
1	SET	SEALS	488S	ZER

HARDWARE SET NO. 03

FOR USE ON DOOR #(S):

5@012 First and Basement, 5@013 First and Basement

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	IVE
1	EA	PANIC HARDWARE	CD-99-L-NL-17	VON
2	EA	CYLINDER	RIM OR MORTISE AS NEEDED	SCH
1	EA	SURFACE CLOSER	4050 EDA	LCN
1	EA	KICK PLATE	8400 2" LDW	IVE
1	EA	STOP	WS407CCV OR FS436/FS438	IVE
1	SET	SEALS	488S	ZER

EXIT DEVICE LEVER TO INCLUDE TACTILE WARNING (KNURLING).

HARDWARE SET NO. 04

FOR USE ON DOOR #(S):

3@003, 3@011, 3@014, 2@121, 2@12, 2@118

EACH TO HAVE:

6	EA	HW HINGE	5BB1HW 4.5 X 4.5	IVE
2	EA	MANUAL FLUSH BOLT	FB458 OR FB358 AS REQUIRED	IVE
1	EA	DUST PROOF STRIKE	DP2	IVE
1	EA	STOREROOM LOCK	L9080R 17A	SCH
1	EA	COORDINATOR	COR X FL X MB	IVE
2	EA	SURFACE CLOSER	4050 REG OR EDA AS REQ.	LCN
2	EA	KICK PLATE	8400 2" LDW	IVE
2	EA	STOP	WS407CCV OR FS436/FS438	IVE
1	SET	SEALS	488S	ZER
1	SET	MEETING STILE SEAL	8217S	ZER
2	EA	DOOR CONTACT	679-05WD	SCE

INSTALL DOOR CONTACT FOR FUTURE USE.

HARDWARE SET NO. 05
FOR USE ON DOOR #(S):

FOR USE ON DOOR #(S):

1@119, 1@108 From 116, 1@109, 1@110, 1@111, 1@112, 1@113, 1@114, 1@115

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	IVE
1	EA	STOREROOM LOCK	L9080R 17A	SCH
1	EA	SURFACE CLOSER	4050 REG OR EDA AS REQ.	LCN
1	EA	KICK PLATE	8400 2" LDW	IVE
1	EA	STOP	WS407CCV OR FS436/FS438	IVE
1	SET	SEALS	488S	ZER

HARDWARE SET NO. 06

FOR USE ON DOOR #(S):

4@102, 1@108 from 101

EACH TO HAVE:

1	EA	CONT. HINGE	112HD TWP	IVE
1	EA	EU MORTISE LOCK	L9092REU 17A RX	SCH
1	EA	SURFACE CLOSER	4050 HCUSH	LCN
1	EA	KICK PLATE	8400 2" LDW	IVE
1	EA	STOP	WS407CCV OR FS436/FS438	IVE
1	EA	CARD READER	CARD READER 328AA	BYO
1	EA	GASKETING	488S	ZER
1	SET	SEALS	154A	ZER
1	EA	DOOR SWEEP	626A	ZER
1	EA	THRESHOLD	679-05HM	ZER
1	EA	DOOR CONTACT	PS902	SCE
1	EA	POWER SUPPLY		SCE

ALL WIRING AND CONNECTIONS BY ELECTRICAL SUBCONTRACTOR.

OPERATIONAL DESCRIPTION:

FREE EGRESS AT ALL TIMES. ACCESS BY KEY OR BY ACCESS CONTROL SYSTEM CARD READER FROM SECURED SIDE. CARD READER TO UNLOCK ELECTRIFIED LOCK AND ALLOW ACCESS. FAIL SECURE: POWER FAILURE OR FIRE ALARM ACTIVATION NOT WILL UNLOCK LEVER TRIM. DOOR CONTACT TIED TO ACCESS CONTROL SYSTEM SPECIFIED IN SEPARATE SECTION. INSIDE (EGRESS) LEVER HANDLE WITH RX SWITCH

HARDWARE SET NO. 07

FOR USE ON DOOR #(S):

1@104, 1@118, 5@105

EACH TO HAVE:

3	EA	HINGE	5BB1 4.5 X 4.5	IVE
1	EA	STOREROOM LOCK	L9080R 17A	SCH
1	EA	KICK PLATE	8400 2" LDW	IVE
1	EA	STOP	WS407CCV OR FS436/FS438	IVE
3	EA	SILENCER	SR64	IVE

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following work:
 - 1. Glass: Single panes, and insulated glazing units (IGU), fire rated and non-fire rated
 - a. Interior borrowed lites
 - b. Door lites
 - c. Interior Decorative Windows
 - 2. Glazing compounds
 - 3. Accessories as needed for a complete installation
- B. Glass and Glazing Products Furnished by this Section for Installation Under Other Sections:
 - 1. Section 08 11 13 - Hollow Metal Doors and Frames: Doors and borrowed lite frames to receive glazing by this section.
 - 2. Section 08 14 16 - Flush Wood Doors: Door panels with vision lites to receive glazing by this section.
- C. Glass and Glazing products specified in this Section to be furnished and installed by other sections:
- D. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 07 25 00 - Weather Barriers.
 - 2. Section 07 90 05 - Joint Sealers: Sealant and back-up material.
 - 3. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.
 - 4. Section 08 83 00 - Mirrors.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. CPSC. U.S. Consumer Products Safety Commission; www.cpsc.gov
 - a. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
 - 2. ANSI. American National Standards Institute; www.ansi.org
 - a. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.
 - 3. ASTM. ASTM International; www.astm.org
 - a. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 - b. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - c. ASTM C1036 - Standard Specification for Flat Glass.
 - d. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
 - e. ASTM C1193 - Standard Guide for Use of Joint Sealants.

- f. C1376 Specification for Pyrolytic and Vacuum Deposition Coatings on Glass
- g. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- h. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- 4. GANA. Glass Association of North America; www.glasswebsite.com
 - a. GANA (GM) - GANA Glazing Manual; Glass Association of North America.
 - b. GANA (SM) - GANA Sealant Manual; Glass Association of North America.
 - c. GANA (LGDG) - Laminated Glazing Reference Manual; Glass Association of North America.
 - d. ICC (IBC) - International Building Code.
 - e. Bulletin 01-0300 - Proper Procedures for Cleaning Architectural Glass Products
- 5. IGMA. The Insulating Glass Manufacturers Alliance (formerly SIGMA - Sealed Insulating Glass Manufacturers Association); www.igmaonline.org
 - a. SIGMA TM-3000 -Glazing Guidelines for Sealed Insulating Glass Units
- 6. UL. Underwriters Laboratories Inc.; www.ul.org
 - a. UL (BMD) - Building Materials Directory (Fire Resistance Directory)

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination per Section 01 31 14.
- B. Sequencing and Scheduling per Section 01 32 16

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Construction Submittals:
 - 1. Product Data: Submit manufacturer's printed product literature including products standards, identifying materials, finishes, protective coatings, use limitations, and recommendations.
 - a. Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 - b. Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
 - c. Metal Window Panels: Provide product information as well as as configuration of panel as specified.
 - 2. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
 - 3. Samples: Submit three (3) samples 12 x 12 inch in size of glass units, showing coloration and design.
 - 4. Samples of metal window panels: Submit two (2) 10 inch by 10 inch demonstrating color, finish and construction.
 - 5. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - a. See Section 01 60 00 - Product Requirements, for additional provisions.
 - b. Extra Insulating Glass Units: One of each glass size and each glass type.
- C. CLOSEOUT SUBMITTALS:
 - 1. Submittal Procedures per Section 01 78 00, and as follows:
 - a. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Regulatory Agency Approvals:
 - 1. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are

SECTION 08 80 00 2

listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

- a. Listings and Labels: Fire rated framing and glazing shall be under current follow-up services by UL or Internek/Warnack Hersey, and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.
 2. Safety Glazing Products: Comply with requirements of CSPC 16 CFR 1201 and ANSI Z97.1
 3. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - a. GANA Publications: GANA (LGRM) and GANA (GM)
 - b. IGMA Publication for Insulating Glass: SIGMA TM-3000
 4. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
 - a. Insulating Glass Certification Council
 - b. Associated Laboratories, Inc.
- B. Manufacturer Qualifications: Company with a minimum of ten (10) years experience specializing in manufacturing Products specified in this Section.
- C. Metal Window panels
- D. Single Source Responsibility:
1. Glass: Obtain the following through one source from a single manufacturer for each glass type: Clear float glass, coated float glass, laminated glass, and insulating glass units (IGU).
 2. Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.
 3. Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

1.07 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for additional mock-up requirements.
- B. Provide mockup of Glass and Glazing Assemblies including glass and air barrier and vapor retarder seal as indicated by the Drawings utilizing specified and approved submittal materials demonstrating the anticipated range of materials, workmanship and finish expected.
 1. Glass and Glazing Assembly mock-up(s) to be fully tested to ensure that the systems meet the performance requirements of the Specification by application of the maximum applied loads, in-situ conditions, and structural movements.
 2. Notify Architect 7 days in advance of time when mock-up will be installed for approval viewing.
 3. Modify and/or replace mock-ups as many times as necessary to obtain Architect's approval.
 4. Obtain approval in writing before commencing work.
 5. Protect the approved mock-up during construction period as it will be used to comparatively judge the finished installation
 6. Mockup may remain as part of the Work if undisturbed at time of Substantial Completion.
 7. Do not destroy accepted samples until directed

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, and Section 01 60 00.

1.10 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.11 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Sealed Insulating Glass Units: Provide written five (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units, issued by the manufacturer upon completion of the work and beginning on the date of Substantial Completion. Defects are as follows:
 - 1. Discoloration of veil material by more than 2.0 delta E per ASTM D 2244-02e1 (Reapproved 2005);
 - 2. Loss of light transmittance greater than 3%, determined according to manufacturer's technical data;
 - 3. Seal leakage;
 - 4. Substantial deterioration of insulating insert;
 - 5. Crushing or corrosion of spacer;
 - 6. Buildup of visible internal moisture.
- C. Fire Rated Glazing: Provide written five (5) year warranty for material obstruction of vision between the interior glass surfaces, downgrading of the fire rating, and other defects including replacement of defective units, issued by the manufacturer upon completion of the work and beginning on the date of Substantial Completion
- D. Laminated Glass: Provide a five year warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass and IGU - Basis-of-Design Manufacturer: PPG Industries, Inc.; www.ppgideascape.com; www.ppg.com/en/solutionbyindustry/construction/Pages/default.aspx, or Architect acceptable equivalent products subject to compliance with requirements from one of the following manufacturers (unless otherwise noted):
 - 1. AGC Industries Inc.; www.us.agc.com/
 - 2. Cardinal Corporation; www.cardinalcorp.com
 - 3. Pilkington North America Inc; www.pilkington.com
 - 4. Viracon, Apogee Enterprises, Inc; www.viracon.com
 - 5. Substitution Limitations: See Section 01 60 00, Product Requirements.
- B. Fire Rated Glazing - Product / Manufacturer. Subject to compliance with requirements, provide one of the following:
 - 1. Keralite FRF by Vetrotech Saint-Gobain North America; <http://www.vetrotech.com/us/eng/>
 - 2. Pyran Platinum by SaftiFirst, a Division of O'Keeffe's; www.safti.com
 - 3. FireLite NT by TGP - Technical Glass Products; www.fireglass.com
 - 4. Pyrodur by Pilkington North America Inc; www.pilkington.com
 - 5. Substitution Limitations: See Section 01 60 00, Product Requirements.

2.02 DESCRIPTION

- A. Regulatory Requirements:
 - 1. Glass-Ceramic Safety Glazing: UL- or WH-listed as fire-protection-rated glazing and complying with 16 CFR 1201 test requirements for Category II without the use of a surface-applied film.
 - 2. 20-Minute Fire Doors: Hose stream test is not required

2.03 GLAZING TYPES

- A. Type IG-1 - Sealed Insulating Glass Units: Vision glazing; between-lite space filled with Argon gas.
 - 1. Application(s): All exterior glazing unless otherwise indicated.

2. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum low-iron; PPG Starphire or equal.
 - a. Tint: Clear.
3. Coating: Low-E type , on #2 surface; PPG Solarban 60 or equal.
4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum low-iron; PPG Starphire or equal.
 - a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Edge Spacer: Stainless Steel
7. Solar Heat gain Coefficient: .41
8. Visible Light Transmittance: 74 percent, nominal.
9. VLT/SHGC ratio: 1.80
- B. Type IG-2 - Sealed Insulating Glass Units:
 1. Application: Exterior glazing where indicated.
 2. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Same as on vision units, on #2 surface.
 3. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
 - a. Tint: Clear.
 - b. Opacifier: Ceramic frit, on #3 surface or #4 surface.
 - c. Opacifier Color: As selected by Architect.
 4. Total Thickness: 1 inch.
- C. Type S-5 - Fire-Protection-Rated Glazing:
 1. IBC Fire Protection Rating: D-H-NT-20, minimum, with hourly rating to conform to building code for the rating of the opening protective..
 2. Applications: Provide this type of glazing in the following locations:
 - a. Glazed lites in fire doors.
 - b. Sidelights, borrow lites, and other glazed openings in partitions indicated as having an hourly fire rating.
 - c. Other locations indicated on the drawings.

2.04 PERFORMANCE / DESIGN CRITERIA

- A. Exterior Glazing Assemblies:
 1. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with Commonwealth of Massachusetts building code.
 - a. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
 - b. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
 - c. Thicknesses listed are minimum.
 2. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier:
 - a. In conjunction with vapor retarder and joint sealer materials described in other sections.
 - b. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

2.05 GLASS MATERIALS

- A. Float Glass: All glazing is to be float glass unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 - 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
 - 3. Tinted Types: Color and performance characteristics as indicated.
 - 4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.

2.06 GLAZING COMPOUNDS

- A. Butyl Sealant : Single component; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; Shore A hardness of 10 to 20; black color; non-skinning.
- B. Silicone Sealant : Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; color as selected.

2.07 GLAZING ACCESSORIES

- A. General:
 - 1. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.
 - 2. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
 - 3. Setting Blocks, Spacers: Compatible with TGU sealant.
- B. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- C. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- D. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; sizes appropriate to application size; black color.
- E. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; black color.
- F. Glazing Clips: Manufacturer's standard type.

2.08 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze 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.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
 - 1. Carefully examine installation areas with Glazing Installer present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, substrates, structural support, tolerances, sizes, squareness, offsets at corners, levelness, plumbness, humidity, moisture content level, functioning weep system, minimum face and edge clearances, sealed joints, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings, which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.
 - 1. Clean contact surfaces with solvent and wipe dry.
 - B. Prime surfaces scheduled to receive sealant.
 - C. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.
 - D. Install sealant in accordance with manufacturer's instructions.
- 3.03 INSTALLATION - GENERAL**
- A. Glass and Glazing units are furnished to multiple Sections for installation in accordance with the Drawings, the Specifications, approved submittals, manufacturer's instructions, GANA (GM), GANA (LGRM), GANA (SM), and the following. Glass and Glazing units furnished by this trade and other contractors shall be in accordance with these specifications, the drawings, approved submittals, manufacturer's instructions, GANA (GM), GANA (LGRM), GANA (SM) and the following.
- 3.04 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)**
- A. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
 - B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
 - C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.
- 3.05 INSTALLATION - EXTERIOR DRY METHOD (TAPE AND GASKET SPLINE GLAZING)**
- A. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
 - B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
 - C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
 - D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
 - E. Trim protruding tape edge.
- 3.06 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)**
- A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.
 - B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
 - C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
 - D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.
 - E. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
 - F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.
 - G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.
- 3.07 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)**
- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.
 - B. Locate and secure glazing pane using glazers' clips.
 - C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.
- 3.08 CLEANING**

- C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details specific to each wall type in the project in which louvers are located; blade configuration, screens, blankout areas required, and frames.
- D. Samples: Submit three samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.
- E. Test Reports: Independent agency reports showing compliance with specified performance criteria.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS:

- A. Submittal Procedures: Section 01 78 00 - Closeout Submittals, for submittal procedures.
 - 1. Warranty Documentation: Executed warranty.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum five years of documented experience.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide one year manufacturer warranty against distortion, metal degradation, and failure of connections.
 - 1. Finish: Include coverage against degradation of exterior finish for a period of ten (20) years minimum
 - 2. Issued by the manufacturer upon completion of the Work and beginning on the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wall Louvers:
 - 1. Basis of Design Manufacturer / Product: Greenheck; www.greenheck.com / EHH501, or an Architect acceptable equivalent subject to compliance with requirements from one of the following:
 - a. American Warming and Ventilating: www.awv.com.
 - b. Nystrom Building Products : www.nystrom.com
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOUVERS

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified under AMCA 511.
 - 1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
 - 2. Louvers shall be Class A per AMCA 550 Wind Driven rain tests for minimal water intrusion.
 - 3. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
 - 4. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
 - 5. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.
- B. Stationary Louvers : Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
 - 1. Free Area: 43 percent, minimum.
 - 2. Blades: wind-driven rain louver horizontal blade.
 - 3. Frame: Five inches deep, channel profile; corner joints mitered and, with continuous

recessed caulking channel each side.

4. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
5. Finish: three-coat 70 percent solids Fluoropolymer coating, finished after fabrication.
6. Color: Custom, to match approved sample.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), .
- B. Bird Screen: Interwoven wire mesh of steel, 0.051 inch diameter wire, 3/4 inch open weave, diagonal design.
- C. Insect Screen: 18 x 16 size aluminum mesh.
- D. Polyvinylidene Fluoride Coating: Minimum 70 percent Kynar 500/Hylar 500 resin, three coat finish, complying with AAMA 2605.
 1. Three-Coat System: Nominal 0.8 mils each of a urethane primer, fluoropolymer color coat, and a clear topcoat to seal and protect the entire system. the total film thickness is 2.25-2.55 mils.
 2. Field Touch-up Materials: As recommended by coating manufacturer for field application.

2.04 ACCESSORIES

- A. Blank-Off Panels: Aluminum face and back sheets, polyisocyanurate foam core, 1-1/2 inch thick, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
- B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- C. Fasteners and Anchors: Stainless steel.
- D. Flashings: Of same material as louver frame, extruded to required shape, single length in one piece per location.
- E. Sealant: See Section 07 90 05

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
 1. Carefully examine installation areas with Installer/ Applicator present, for compliance with requirements affecting Work performance.
 - a. Verify that opening field measurements, surfaces, substrates, structural support, utility connections, tolerances, levelness, plumbness, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions, Drawings, approved submittals and as follows:
 1. Install louvers level and plumb.
 2. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
 3. Secure louver frames in openings with concealed fasteners.
 4. Install perimeter sealant and backing rod in accordance with Section 07 90 05.
 5. Coordinate with installation of mechanical ductwork.
 6. Coordinate with installation of louver actuators.

3.03 FIELD QUALITY CONTROL

- A. Non-conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items.
 - 1. Finish touch-up damaged surface finishes.
 - 2. Replace damaged materials or items with New if repair is not acceptable to Architect.

3.04 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal
 - 1. Strip protective finish coverings.
 - 2. Clean surfaces and components.

3.05 PROTECTION

- A. Protect installed work from subsequent construction operations until date of Final Completion or Owner Occupancy, whichever occurs first.

END OF SECTION

SECTION 09 00 02

TILE FILED SUB-BID SUMMARY

PART 1 GENERAL

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this section shall include all hard-surface tile wall and floor finishes for the Project, including all required accessories identified within the specification sections referenced below, and necessary to provide a complete installation.
- B. The Work of this Filed Sub-Bid Section may be (but is not necessarily always) indicated in the drawings with the note: by "tile contractor".
- C. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - 1. Section 09 30 00 - TILING
- D. The Work of this Filed Sub-Bid Section shall include part of the scope of each of the following Sections:
 - 1. 07 90 05 - Joint Sealers: Sealant at control joints within tile work and other joints at tile where indicated on drawings.

- E. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- G. Waste Removal/Dumpster: This subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- H. Temporary Heat: This Sub-Bidder shall be responsible for providing adequate enclosure of their work area, which shall include erection of tenting or other similar enclosure of scaffolding prior to enclosure of the building. This General Contractor shall be responsible for providing heat to the exterior work area of this Section including tented scaffolding, and heat to the work areas within the building footprint once the superstructure and enclosing walls are erected to a point where temporary enclosure is practical.
- I. Cutting and Patching: This Filed Sub-Bid Subcontractor shall be perform all cutting, coring, and/or patching required to complete the work of this section, except as specifically indicated in respective sections listed as part of the work of this Filed Sub-Bid. Where any of these sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching necessary for the work of this section shall be borne by this Subcontractor. All cutting, coring, and patching shall be coordinated through and by the General Contractor. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- J. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements of the following Sections:
 - 1. 03 30 00 - CAST IN PLACE CONCRETE: Cast-in-place concrete substrate surface and saw-cut joint locations.
 - 2. 09 21 16 - GYPSUM BOARD ASSEMBLIES: Substrate surfaces for wall tile
 - 3. 09 65 00 - RESILIENT FLOORING: interface of tile and other flooring
 - 4. 09 68 13 - TILE CARPETING: interface of tile and other flooring.
 - 5. 10 28 00 - WASHROOM ACCESSORIES
 - 6. 12 48 13 - ENTRANCE FLOOR MATS AND FRAMES: interface of tile and recessed entry mats and frames.
 - 7. Division 22 - PLUMBING sections
 - 8. Division 26 - ELECTRICAL sections
- K. Primary Drawings listed are those intended to indicate the Scope of Work for this trade. Additionally, ALL Subcontractors must include in the List of Drawings including all project detail sheets for general and code-related information, installation or other conditions and instructions that directly affect their work.
 - 1. List of Primary Drawings: T-1.1, A-1.1, A-1.1 ALT, A-1.2, A-1.6, A-1.6ALT, A1.7, A-3.2, A-3.2ALT, A-3.10
- L. In addition to the above listed "Primary Drawings" that define the scope of this section, this subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications

procedures, closeout procedures.

- C. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- D. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- E. Section 01 41 00 - Regulatory Requirements
- F. Section 01 50 00 - Temporary Facilities and Controls.
- G. Section 01 57 21 - Indoor Air Quality Controls: Procedures and testing; smoking room testing; LEED requirements.
- H. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. See Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 REFERENCE STANDARDS

- A. Refer to individual specification Sections listed above for Reference Standards.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to individual specification sections listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 QUALITY ASSURANCE

- A. Refer to individual specification sections listed above for additional requirements.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. See individual Sections listed above for warranty requirements.

PART 2 PRODUCTS (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR PRODUCT REQUIREMENTS)

PART 3 EXECUTION (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR EXECUTION REQUIREMENTS)

3.01 CLEANING

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 09 00 03

ACOUSTIC CEILINGS FILED SUB-BID BID SUMMARY

PART 1 GENERAL

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this section shall include all acoustic panel and tile ceilings for the Project, including all required accessories identified within the specification sections referenced below, and necessary to provide a complete installation.
- B. The Work of this Filed Sub-Bid Section may be (but is not necessarily always) indicated in the drawings with the abbreviation of "ACT CONTRACTOR".
- C. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - Section 09 51 00 - Acoustical Ceilings
- D. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional

information.

- E. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Waste Removal/Dumpster: This subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- G. Cutting and Patching: This Filed Sub-Bid Subcontractor shall be perform all cutting, coring, and/or patching required to complete the work of this section, except as specifically indicated in respective sections listed as part of the work of this Filed Sub-Bid. Where any of these sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching necessary for the work of this section shall be borne by this Subcontractor. All cutting, coring, and patching shall be coordinated through and by the General Contractor. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- H. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements of the following Sections:
 - 1. Section 09 21 16 - GYPSUM BOARD ASSEMBLIES
 - 2. Section 09 90 00 - PAINTING AND COATING
 - 3. Division 21 FIRE PROTECTION sections
 - 4. Division 23 HVAC Sections
 - 5. Division 26 ELECTRICAL Sections
- I. Primary Drawings listed are those intended to indicate the Scope of Work for this trade. Additionally, ALL Subcontractors must include including all project detail sheets for general and code-related information, installation or other conditions and instructions that directly affect their work.
 - 1. List of Primary Drawings: T-1.1, A-1.1, A-1.1 ALT, A-1.2, A-1.4, A-1.4 ALT, A-1.5, A-3.2, A-3.2ALT, A-3.3, A-3.4, A-3.4 ALT, A-3.5, A-3.5 ALT, A-3.6, A-3.6 ALT, A-3.6A, M-1.1, M-1.2, M-1.3, M-1.4, E-1.1, E-1.2, E-2.1, E-2.2, FP-1.1, FP-1.2
- J. In addition to the above listed "Primary Drawings" that define the scope of this section, this subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- D. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- E. Section 01 41 00 - Regulatory Requirements
- F. Section 01 50 00 - Temporary Facilities and Controls.
- G. Section 01 57 21 - Indoor Air Quality Controls: Procedures and testing; smoking room testing; LEED requirements.
- H. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options,

delivery, storage, and handling.

- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. See Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 REFERENCE STANDARDS

- A. Refer to individual specification sections listed above for Reference Standards.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to individual specification sections listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 QUALITY ASSURANCE

- A. Refer to individual specification sections listed above for Quality Assurance requirements.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Refer to individual specification section referenced above for warranty requirements.

PART 2 PRODUCTS (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR PRODUCT REQUIREMENTS)

PART 3 EXECUTION (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR EXECUTION REQUIREMENTS)

3.01 CLEANING

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 09 00 05

RESILIENT FLOORING FILED SUB-BID SUMMARY

PART 1 GENERAL

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract. this section is responsible to furnish and install vinyl base at tile carpeted areas . (SECTION 09 68 13)
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this section shall include furnishing and installation of all resilient flooring and resilient wall base materials construction for the Project, including all accessories identified within the specification sections referenced below, and necessary to provide a complete installation.
- B. The Work of this Filed Sub-Bid Section may be (but is not necessarily always) indicated in the drawings with the "BY FLOORING CONTRACTOR".
- C. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - 1. Section 09 65 00: RESILIENT FLOORING
- D. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All

hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.

- E. Waste Removal / Dumpster: This subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Cutting and Patching: This Filed Sub-Bid Subcontractor shall be perform all cutting, coring, and/or patching required to complete the work of this section, except as specifically indicated in respective sections listed as part of the work of this Filed Sub-Bid. Where any of these sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching necessary for the work of this section shall be borne by this Subcontractor. All cutting, coring, and patching shall be coordinated through and by the General Contractor. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- G. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements of the following Sections:
 - 1. Section 03 30 00 - CAST IN PLACE CONCRETE
 - 2. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES: base applied to framing
 - 3. Section 08 71 00 - FINISH HARDWARE: door saddles and thresholds
 - 4. Section 08 43 13 - ALUMINUM-FRAMED STOREFRONT: resilient base applied to framing
 - 5. Section 09 21 16 - GYPSUM BOARD ASSEMBLIES
 - 6. Section 09 30 00 - TILING
 - 7. Section 09 68 13 - TILE CARPETING
 - 8. Section 09 90 00 - PAINTING AND COATING
 - 9. Section 14 20 10 - PASSENGER ELEVATORS
- H. Primary Drawings listed are those intended to indicate the Scope of Work for this trade. Additionally, ALL Subcontractors must include in the List of Drawings, including all project detail sheets for general and code-related information, installation or other conditions and instructions that directly affect their work.
 - 1. List of Primary Drawings: T-1.1, A-1.1, A-1.1 ALT, A-1.2, A-1.6, A-1.6 ALT, A-1.7, A-3.2, A-3.2ALT, A-3.7, A-3.8, A-3.10,
- I. In addition to the above listed "Primary Drawings" that define the scope of this section, this subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- D. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- E. Section 01 41 00 - Regulatory Requirements
- F. Section 01 50 00 - Temporary Facilities and Controls.
- G. Section 01 57 21 - Indoor Air Quality Controls: Procedures and testing; smoking room testing; LEED

requirements.

- H. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. See Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 REFERENCE STANDARDS

- A. See individual Sections listed above for referenced standards.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to individual specification sections listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 QUALITY ASSURANCE

- A. Refer to individual specification sections listed above for additional requirements.

1.08 WARRANTY

- A. See individual Sections listed above for warranty requirements.

END OF SECTION

SECTION 09 00 07

PAINTING FILED SUB-BID SUMMARY

PART 1 GENERAL

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The Work of this Section includes furnishing and installing all paint and coating systems as shown on the Drawings, as described in the Specifications, or as reasonably inferred from either, in the opinion of the Architect.
- B. The Work of this Filed Sub-Bid Section may be (but is not necessarily always) indicated in the drawings with the note "By Painting contractor".
- C. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - 1. Section 09 90 00 - Painting and Coating
 - 2. Section 09 91 02 - Painting Systems Schedule
- D. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional

information.

- E. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Waste Removal/Dumpster: This subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- G. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements of the following Sections:
 - 1. Section 03 30 00 - CAST IN PLACE CONCRETE
 - 2. Section 04 20 00 - UNIT MASONRY
 - 3. Section 05 50 00 - METAL FABRICATIONS
 - 4. Section 06 20 00 - FINISH CARPENTRY
 - 5. Section 06 41 00 - ARCHITECTURAL WOOD CASEWORK
 - 6. Section 07 46 46 - FIBER CEMENT SIDING
 - 7. Section 07 81 00 - APPLIED FIREPROOFING
 - 8. Section 07 84 00 - FIRESTOPPING
 - 9. Section 07 90 05 - JOINT SEALERS
 - 10. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES
 - 11. Section 09 21 16 - GYPSUM BOARD ASSEMBLIES
 - 12. Section 10 26 01 - WALL AND CORNER GUARDS
 - 13. Division 21 - FIRE PROTECTION sections
 - 14. Division 22 - PLUMBING sections
 - 15. Division 23 - HVAC sections
 - 16. Division 26 - ELECTRICAL sections
 - 17. Division 32 - EXTERIOR IMPROVEMENTS sections
- H. Primary Drawings listed are those intended to indicate the Scope of Work for this trade. Additionally, ALL Subcontractors must include in the List of Drawings, including all project detail sheets for general and code-related information, installation or other conditions and instructions that directly affect their work.
 - 1. List of Primary Drawings: T-1.1,A-1.1, A-1.1 ALT, A-1.2, A-1.3, A-1.4, A-1.4 ALT, A-1.5, A-1.6, A-1.6 ALT,A-1.7, A-2.1, A-2.2, A-2.3, A-2.4, A-2.5, A-2.6, A-3.1, A-3.2,A-3.2ALT, A-3.3, A-3.4, A-3.4 ALT, A-3.5, A-3.5 ALT, A-3.6, A- 3.6 ALT, A-3.6A, A-3.7, A-3.8, A-3.9, A-3.10, A-3.11, A-3.12, A-3.13
- I. In addition to the above listed "Primary Drawings" that define the scope of this section, this subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and

documentation, reports, coordination.

- D. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- E. Section 01 41 00 - Regulatory Requirements
- F. Section 01 50 00 - Temporary Facilities and Controls.
- G. Section 01 57 21 - Indoor Air Quality Controls: Procedures and testing; smoking room testing; LEED requirements.
- H. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. See Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 REFERENCE STANDARDS

- A. Refer to individual specification sections listed above for Reference Standards.

1.06 SUBMITTALS

- A. Refer to individual specification sections listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 QUALITY ASSURANCE

- A. Refer to individual specification sections listed above for additional requirements.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Refer to individual specification sections listed above for warranty requirements.

PART 2 PRODUCTS (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR PRODUCT REQUIREMENTS)

PART 3 EXECUTION (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR EXECUTION REQUIREMENTS)

3.01 CLEANING

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, erecting, and installing the following Gypsum Board Assembly work:
 - 1. Metal stud wall framing (non-structural).
 - 2. Gypsum Ceiling Suspension System
 - 3. Acoustic batt insulation and sealant
 - 4. Gypsum sheathing.
 - 5. Cementitious backing board.
 - 6. Gypsum wallboard.
 - 7. Joint treatment.
 - 8. Accessories needed for a complete installation, including but not limited to fasteners, corner bead, gypsum edge trim, and acoustic sealant.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 01 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 06 10 00 - Rough Carpentry: Wood framing, Wood blocking within walls.
 - 2. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire rated walls.
 - 3. Section 07 90 05 - Joint Sealers: Acoustic and other sealant
 - 4. Section 08 11 13 - Hollow Metal Doors and Frames
 - 5. Section 08 31 00 - Access Doors and Panels: For installation into gypsum board assemblies.
 - 6. Section 09 30 00 - Tiling: Substrate requirements for tile
 - 7. Section 09 51 00 - Acoustical Ceilings
 - 8. Section 09 90 00 - Painting and Coating
 - 9. Section 10 14 00 - Signage
 - 10. Section 10 26 01 - Corner Guards
 - 11. Section 10 28 00 - Washroom Accessories
 - 12. Section 10 44 00 - Fire Protection Specialties

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM. ASTM International; www.astm.org
 - a. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute. (replaced SG-971)
 - b. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units.
 - c. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.

- d. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - e. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - f. ASTM C635 - Standard specification for the manufacture, performance, and testing of metal suspension systems for tile and lay-in panel ceilings
 - g. ASTM C636 - Standard practice for installation of metal ceiling suspension systems for acoustical tile and lay-in panels
 - h. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
 - i. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - j. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - k. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
 - l. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - m. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - n. ASTM C1264 - Standard Specification for Sampling, Inspection, Rejection, Certification, Packaging, Marking, Shipping, Handling, and Storage of Gypsum Board.
 - o. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel.
 - p. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing.
 - q. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets.
 - r. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
 - s. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
 - t. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - u. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - v. ASTM E119 - Standard Methods of Fire Tests of Building Construction and Materials
 - w. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
 - x. ASTM E413 - Classification for Rating Sound Insulation.
- 2. GA. Gypsum Association; www.gypsum.org
 - a. GA-214 - Recommended Levels of Gypsum Board Finish
 - b. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association.
 - c. GA-600 - Fire Resistance Design Manual; Gypsum Association.
 - 3. UL. Underwriters Laboratories Inc.; www.ul.org
 - a. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..

1.04 SUBMITTALS

A. Construction Submittals:

- 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- 2. Product Data: Provide manufacturer's data on each product of metal framing, gypsum board, accessories,

and joint finishing system.

3. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
4. Test Reports: For all stud framing products that do not comply with ASTM C645 or C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
5. Certificates: Asbestos-free materials.

1.05 QUALITY ASSURANCE

- A. Regulatory Agency Approvals:
 1. Gypsum board assemblies shall conform to UL (FRD) ratings meeting fire resistance ratings determined according to ASTM E119, indicated by the Drawings or by application and building type.
 2. STC-Rated Assemblies: Provide materials and construction identical to those assemblies tested according to ASTM E90 and classified according to ASTM E413 by a testing and inspecting agency.
- B. Single Source Responsibility: Furnish Metal Framing materials as well as Board materials from one manufacturer for entire Project, unless otherwise acceptable to Architect.
- C. Certifications: Certify to Owner, in writing, that all components and materials of wallboard systems are asbestos-free.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 60 00 Product Requirements, for additional requirements.
- B. Comply with manufacturer's instructions and recommendations, ASTM C1264 and the following:
 1. Deliver all materials in their original unopened packages
 2. Store in an enclosed shelter providing protection from damage and exposure to the elements.
 3. Stack panels flat on leveled supports off floor or slab to prevent sagging.
 4. Coordinate delivery with installation to minimize storage periods at project site.
 5. Materials damaged or deteriorated before or after installation, shall be removed from the site.

1.07 FIELD CONDITIONS

- A. Ambient Conditions: Comply with manufacture's recommendations, ASTM C840, and as follows:
 1. Maintain temperature range within 55 to 70 deg F when gypsum wallboard is stored, applied and finished.
 2. Provide adequate ventilation to carry off excess moisture.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 1. See PART 3 for finishing requirements.
- B. Interior Partitions : Provide completed assemblies with the following characteristics:
 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies where shown on drawings and complying with Building Code
 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory.

2.02 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 1. Basis-of-Design Manufacturer / Product: Marino / Viper Stud: www.marionware.com, or an Architect acceptable equivalent product subject to compliance with requirements from one of the following

manufacturers:

- a. Clarkwestern Dietrich Building Systems LLC; Product ProStud: www.clarkdietrich.com.
 - b. Phillips Manufacturing Company; Product Viperstud: www.phillipsmfg.com.
2. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
1. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
 2. Studs: "C" shaped with flat or formed webs with knurled faces(to facilitate use of self tapping fasteners).
 3. Depth of section: As shown on Drawings.
 4. Flange width: Not less than 1.25 inch
 5. Runners: U shaped, sized to match studs.
 6. Steel and Finish: ASTM A653, minimum galvanizing - G60
 7. Ceiling Channels: C shaped.
 8. Furring: Hat-shaped sections, minimum depth of 7/8 inch. Minimum face width of 1.25 inch.
 9. Maximum deflection of wall framing behind tile finish is to be L/360 at 5 psf.
- C. Resilient Furring Channels: 1/2 inch depth, for attachment to substrate through one leg only.
1. Manufacturers - Resilient Furring Channels:
 - a. Same manufacturer as other framing materials.
- D. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
1. Manufacturers - Shaft Wall Studs and Accessories:
 - a. Same manufacturer as other framing materials.
- E. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- F. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
 3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
 4. Deflection and Firestop Track:
 - a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.

2.03 GYPSUM CEILING SUSPENSION SYSTEM

- A. Suspension system for gypsum board ceilings shall be a pre-engineered suspended tee grid system consisting of cold rolled steel main and cross tees with hot dip galvanized finish.

- B. Main tees shall be 1 1/2 inch high x 144 inch long with minimum 1 3/8 inch wide knurled face of fire-rated heavy duty classification. Tees shall be pre-punched for hanger wire holes and cross-tee intersections.
- C. Cross tees shall be 1 1/2 inch high x 48 inch long with minimum 1 3/8 inch wide knurled face. Cross tees shall feature positive locking end tabs to facilitate removability without the need for tools.
- D. Wall track shall be 1 1/2 inch high x 144 inch long x minimum 1 inch wide channel shape.
- E. Accessory pieces shall be provided and installed as needed to facilitate a complete installation.
- F. Hanger wire shall be 12 gage, spaced maximum 48 inch o.c. and per UL Fire Resistance Directory (FRD) at fire rated assemblies. Locate hangers within 12 inches of splice or transition clip. Do not suspend hanger wires from mechanical, plumbing, or electrical equipment occurring above the ceiling.
- G. Fastener shall be of type and size as recommended by manufacturer of suspended steel ceiling system.

2.04 **BOARD MATERIALS (NOTE: BOARD TYPES APPEAR OUT OF ORDER AND REFERENCE VARIOUS FINISHES LOCATED THROUGHOUT THE PROJECT. CONTRATOR IS TO USE THE TYPE CALLED OUT BELOW FOR SPECIFIC USE, DRAWINGS DO NOT IDENTIFY LOCATION)**

- A. **GWB 1 Gypsum Wallboard:** Non-reinforced paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces above 10 ft above floor, unless otherwise indicated.
 - 2. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 3. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
 - 4. Manufacturers:
 - a. Basis-of-Design Manufacturer / Product: USG Corporation; Sheetrock Brand Gypsum Panels
 - b. CertainTeed Corporation; ProRoc Brand Gypsum Board with M2Tech
 - c. Georgia-Pacific Gypsum; ToughRock Mold-Guard Wallboard.
 - d. National Gypsum Company; Gold Bond Brand Gypsum Wallboard.
 - 5. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions:: See Section 01 60 00 - Product Requirements.
- B. **GWB 2 Moisture Resistant Paper-Faced Products:**
 - 1. Application: Use for vertical surfaces at rooms subject to high moisture or humidity not indicated to receive tile finish, unless otherwise indicated.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required at all locations.
 - 3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
 - 5. Manufacturers:
 - a. Basis of Design: USG Corporation; Sheetrock Brand Mold Tough AR Gypsum Panels.
 - b. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board with M2Tech.
 - c. Georgia-Pacific Gypsum; ToughRock Mold-Guard and ToughRock Mold-Guard Type X Gypsum Wallboard.
 - d. National Gypsum Company; Gold Bond Hi-Abuse Brand XP Wallboard.

- e. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: See Section 01 60 00 - Product Requirements.

C. **GWB 3** Cementitious Tile Backer Board For Wet Areas:

1. intended to receive a tile finish, and other areas indicated on Drawings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 1/2 inch.
 - b. Products:
 - 1) Basis-of-Design Manufacturer / Product: USG Corporation; Durock Brand Cement Board
 - 2) Custom Building Products; Wonderboard.
 - 3) National Gypsum Company; PermaBase Brand Cement Board.
 - 4) Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: See Section 01 60 00 - Product Requirements.

Application: Surfaces behind tile in wet areas including toilet rooms, Janitors Rooms

ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh

D. **GWB 4** Ceiling Board: Special sag-resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 5/8 inch.
 - a. At non-fire rated ceilings
3. Edges: Tapered.
4. Products:
 - a. Basis of Design product: USG Corporation; Sheetrock Brand Sag-Resistant Interior Gypsum Ceiling Board.
 - b. Georgia-Pacific Gypsum; ToughRock CD Ceiling Board.
 - c. National Gypsum Company; Gold Bond brand High Strength Brand Ceiling Board.
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: See Section 01 60 00 - Product Requirements.
 - e. Basis of Design Manufacturer / Product: USG Corporation; Sheetrock Exterior Gypsum Ceiling Board.
 - f. CertainTeed Corporation; ProRoc Brand Exterior Soffit Board.
 - g. Georgia-Pacific Gypsum; ToughRock Soffit Board.

- h. National Gypsum Company; Gold Bond Brand Exterior Soffit Board.
 - i. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions:: See Section 01 60 00 - Product Requirements.
5. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
- a. Paper Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
 - b. Products:
 - 1) Basis-of-Design Manufacturer / Product: USG Corporation; Sheetrock Gypsum Liner Panels, or an Architect acceptable equivalent product subject to compliance with requirements from one of the following manufacturers:
 - (a) Georgia-Pacific Gypsum; DensGlass Shaftliner
 - (b) National Gypsum Company; Gold Bond Brand 1" Fire-Shield Shaftliner.
 - 2) Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

- A. Acoustic Batt Insulation For Typical Partition Types: ASTM C665; preformed glass fiber, friction fit type, unfaced. thickness as indicated on drawings
- B. Acoustic Sealant: Non-hardening, non-skinning, non-migrating for use in conjunction with gypsum board as recommended by wallboard manufacturer, paintable wherever exposed to view.
- C. Mineral Wool insulation - semi-rigid, preformed mineral fiber. Minimum density 12 pounds per cubic foot meeting requirements of ASTM E 136. Thermafiber Industrial felt or approved equivalent.
- D. Finishing Accessories: ASTM C1047, galvanized steel, unless otherwise indicated.
 - 1. Types: As detailed or required for finished appearance.
 - 2. Polymer-reinforced paper corner bead designed for impact resistance shall be used to reinforce all vertical and horizontal external corners.
 - 3. Galvanized metal trim shall be applied over gypsum edge where partition or ceiling terminates against masonry or other dissimilar material. Hold board away from contact with exterior masonry walls, structural columns and beams and at least 1/4 inch from pipes.
 - 4. Control Joints: One-piece joint assembly of non-corrosive metal or extruded vinyl with continuous unperforated expansion strip for insertion into joint, and perforated flanges for fastening to face of wallboard. Must comply with ASTM C 1047.
- E. Joint Treatment: Tape may be plain or perforated, compound to be adhesive with or without fillers, all complying with ASTM C 475. Compound may be dry powder or premixed, and either single compound for both bedding and finish coats, or two component treatment, one for bedding and the other for finishing joints.
 - 1. Self adhering vinyl tape shall be used for raw edges of water resistant wallboard (GWB 4).
 - 2. Use special water resistant type joint compound for treatment of joints, fasten heads and cut edges of water resistant wallboard (GWB 4).

3. Use special chemical hardening type exterior joint compound for exterior applications (GWB5).
 4. Use "setting" type of joint compound for Abuse resistant and Reinforced Gypsum board as recommended by the manufacturer (GWB 2).
- F. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- G. Fasteners shall be Type "S" Bugle Head screws, all 1 1/4 inch minimum length, unless otherwise recommended by manufacturer for application shown or rating required. Fasten gypsum wall assembly types GWB3, GWB4, GWB5 with zinc coated screws.
- H. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Basis-of-Design Wall Reveal: 3/4 inch wide, Pittcon SWR-075-063
 2. Basis-of-Design Gypsum Corner: 3 inch wide, Pittcon ST-300 (3 inch reveal)
 3. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries
 - d. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: See Section 01 60 00 - Product Requirements
 4. Aluminum: Alloy and temper with not less than the strength and durability properties ASTM B 221, alloy 6063-T5.
 5. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements and as follows:
1. Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, surfaces, substrates, structural support, utilities, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - b. Verify that gypsum board materials are not wet, moisture damaged, or mold damaged prior to installation. Remove and replace nonconforming materials.
 - c. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION GENERAL

- A. Install Gypsum Board Assemblies according to the Drawings, approved submittals, manufacturer's instructions, UL (FRD) Listed Assembly requirements, and as follows:
1. Install sound insulation as indicated prior to gypsum board unless readily installed after board has been installed.
 2. Cutting: Wallboard shall be cut scoring and breaking or by sawing, working from face side. Where board meets projecting surface, scribe neatly.
 3. Isolation: Where partitions abut ceiling or deck construction or vertical structural elements, provide slip joint between metal framing and structure to prevent transfer of structural loads or movements.
 4. Partition Height: Unless otherwise indicated, extend all partitions through to structural deck above.
 5. Sound Rated Applications: Comply with requirements indicated by manufacturer to achieve required ratings as proven by their certified laboratory test results.

6. Fasten all GWB3, GWB4, GWB5 gypsum board types with zinc coated screws.
7. Install 12 lb. density mineral wool where indicated for sound insulation around ducts.
8. Incorporate bullet proof panels into wall board systems where indicated in drawings.

3.03 SHAFT WALL INSTALLATION

- A. Shaft Wall Framing at top of elevator shaft: Install in accordance with manufacturer's installation instructions.
- B. Shaft Wall Liner at top of elevator shaft: Cut panels to accurate dimension and install sequentially between special friction studs.

3.04 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members at 24 inches on center.
 1. Level ceiling system to a tolerance of 1/1200.
 2. Install bracing as required at exterior locations to resist wind uplift.
- C. Studs: Space studs as indicated, secure in place with a minimum of two screws at each connection.
 1. Extend partition framing to structure in all locations.
 2. Layout location of each wall. Install all framing plumb and true to line
 3. Secure all tracks at 24 inch o.c. maximum and within 6 inches of each end.
 4. Provide double studs on each side of openings and wall intersections. Secure studs to each other with screws.
 5. Where walls do not go above the ceiling line, extend double studs to structure above and secure in place.
 6. Install jack studs, double-headers and sill above and below all openings.
 7. Install blocking and steel plate reinforcement where required for other trades and wall mounted items. Refer to drawings.
 8. Install horizontal bracing as required for exterior walls.
 9. Bracing at Chase Walls: Every other stud, at third (1/3) points, but not over 4 feet on center.
 10. Leave framing ready for application of covering materials.
 11. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 16 inches on center.
 1. Orientation: Horizontal and vertical.
 2. Spacing: At 16 inches on center.
- F. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.

3.05 INSTALLATION OF SUSPENDED GYPSUM CEILING SYSTEM

- A. Examine areas to receive materials for conditions that will adversely affect installation. Provide written notification of unacceptable conditions prior to starting work. Do not begin installation until unsatisfactory conditions are resolved.
- B. Verify work above ceiling suspension system is complete and installed in a manner which will not affect the layout and installation of the suspension system components.
- C. Install system in accordance with manufacturer's current printed recommendations, and in compliance with Massachusetts State Building Code.

- D. Non Fire Rated System:
1. Main tees: Installed 48 inches on center, by direct suspension from existing structure, with not less than 12 gage hanger wires spaced 48 inches o.c. along main tee length. Wrap hanger wires tightly 3 full turns at each end. Main tees installed straight, true to line, and at proper elevation.
 2. Cross tees: Installed perpendicular to main runners 16 inches o.c. and adjacent to each un-supported side of recessed fixtures.
 3. Wall track: Installed on vertical surfaces, intersecting suspension components, by appropriate method in accordance with manufacturer's written instructions and industry accepted standards.
 4. Additional hanger wires: Wrapped tightly 3 full turns to structure and component at locations where imposed loads could cause deflection exceeding 1/360 span.
 5. Diagonal hanger wire splay bracing. As required to meet seismic requirements of Massachusetts Building Code.
- E. Fire Rated System: Installed in accordance with UL design guidelines indicated in drawings and details.

3.06 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Partition Insulation: Install wallboard blanket insulation for sound attenuation completely filling spaces between studs to full height of partition/wall, fitting closely to work that penetrates partition/wall. Furnish and install 2 inch x 24 gage flat strapping, not over 2'-0" o.c., on open side of studs, wherever insulation is not contained by gypsum board on both sides of studs.
- C. Ceiling Insulation: Install wallboard blanket insulation for sound attenuation, laid in place for continuous full height coverage.
- D. Acoustic Sealant: Install in accordance with manufacturer's instructions.
1. Partitions: Provide continuous beads of sealant at juncture of both faces of runners or plates with floor and ceiling construction, and wherever wallboard abuts dissimilar materials. Install sealant prior to installation of wallboards.
 2. Ceilings: Provide continuous beads of sealant wherever wallboard abuts dissimilar materials.
 3. Control Joints: Provide continuous beads of sealant between edges of wallboard panels at control joints prior to installation of surface applied accessories.
 4. Place continuous bead at perimeter of each layer of gypsum board.
 5. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, and rough-in boxes.

3.07 BOARD AND GLASS MAT FACED BOARD INSTALLATION

- A. Comply with ASTM C 840. Install to minimize butt end joints, especially in highly visible locations.
1. Provide wallboard of thickness shown and not less than minimum recommended by manufacturer or by code for application shown.
 2. Apply wallboard first to ceilings at right angles to framing members, then to walls. Boards of maximum practical length shall be used so number of end joints are kept to absolute minimum. Bring boards into contact with each other but do not force into place. Install setting type joint compound at abuse resistant and reinforced gypsum board walls to meet manufacturer's recommendations.
 3. Leave rough openings required for installation of other trades. Wallboard joints at openings shall be located so that no end joint will align with edges of openings unless control joints will be installed at these points. End joints shall be staggered and joints on opposite sides of partition shall not occur on the same side.
 4. Wallboard shall be held in firm contact with framing member while fasteners are being driven. Fastening shall proceed from center position of wallboard toward edges and ends. Fasteners shall be set with heads slightly below surfaces of wallboard. take care to avoid breaking face paper of wallboard.
- B. Single-Layer Non-Rated: Install gypsum board using maximum length boards practical, with ends and edges

occurring over firm bearing.

1. Offset at least one stud space on opposite faces of partitions/walls.
- C. Double Layer Application for walls and Ceilings: Mechanically fasten both layers to supports with screws in accordance with manufacturer's instructions for spacing. On walls, apply both layers vertically with vertical joints staggered on opposite side of partitions. On walls and ceilings, offset not less than 12 inches between layers.
- D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 1. Provide solid wood blocking wherever end joints do not bear against framing sills or plates.
 2. Fasten to each support in accordance with manufacturer's recommended spacing, but space fasteners not more than 4 inches o.c. around perimeter at edge and end support and 8 inches o.c. at intermediate supports.
- F. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
 1. Install with 1/4 inch open space where boards abut other work.
 2. Seal cut edges of each piece with water resistant sealant before installation, and seal edges at penetration, and other cut-outs in each sheet.
- G. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- H. Installation on Metal Framing: Use screws for attachment of all gypsum board .
 1. Secure gypsum wallboard to metal studs with Type "S" Bugle Head screws 12 inches o.c. at all studs.
 2. Secure gypsum wallboard to metal stud ceiling framing with Type "W" screws 12 inches o.c. at all supports not to exceed spatial requirement for thickness of gypsum wallboard.
- I. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.
- J. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

3.08 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 1. Insert control joint strips into open joint and staple flanges to wallboard in accordance with manufacturer's instructions.
- B. Corner Beads:
 1. Install at external corners, using longest practical lengths.
 2. Install beads using mudded application.
 3. Crimped installation to GWB will not be acceptable.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.
 1. Install unjointed lengths wherever possible.

3.09 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C. General: Tape and finish gypsum board in accordance with manufacturer's published instructions, ASTM C840, GA-216, GA-214, and the following:
 1. All joints, fastener heads, trim accessories and surface defects shall be filled with joint compound in

accordance with manufacturer's recommendations for a smooth, flush surface, with no visible defects after application of field applied decoration.

2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - a. Joints and interior angles taped as in Level 2, with two separate coats of joint compound.
 - b. Accessories and fasteners shall be coated with three separate coats of joint compound.
 - c. Joint compound shall be smooth and free of tool marks and ridges.
 - d. Gloss, semi-gloss and enamel paints are not recommended over a Level 4 finish.
 3. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 - a. Joints and interior angles taped as in Level 2, with two separate coats of joint compound.
 - b. A thin skim coat or topping compound shall be applied to entire surface (this definition is referenced to Terminology, Section II, page 2 of GA-214 to make the description of "skim coat" clear to all).
 - c. The Level 5 finish is required to achieve the highest degree of quality by providing a uniform surface and minimizing the possibility of joint photographing and/or fasteners "burning through" the final decoration.
 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - a. Joints and interior angles have tape embedded in joint compound.
 - b. Surfaces are free of excess joint compound. Accessories and fasteners shall be covered by one separate coat of joint compound.
 - c. Tooled finish with thin skim of compound above tape at time of tape embedment shall be considered a separate coat, otherwise, apply additional coat of compound over tape as required to meet Level 2 requirement.
 5. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
 - a. Joints and interior angles have tape set in joint compound.
 - b. Surfaces are free of excess joint compound
 - c. Tool marks and ridges are acceptable
 - d. Tape and fastener heads do not need to be covered with joint compound.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 2. Taping, filling and sanding is not required at base layer of double layer applications.
- E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- F. Fill and finish joints and corners of cementitious backing board with joint treatment and tape products specifically manufactured for cement board products.
- G. Tool joints as smoothly as possible to minimize sanding and dust.
- H. Protect workers, building occupants, and HVAC systems from gypsum dust.
- I. Finish each concealed joint in wallboard above ceiling finishes flush with tape and a minimum of two coats of compound to provide a continuous, uninterrupted plane for acoustical and fire-resistive performance.
- J. Gypsum Wallboard Fire-Rated Assemblies: Finish in accordance with specified UL (FRD) - Fire Resistance Directory.

3.10 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items prior to inspection for Substantial Completion.
 1. Remove all twisted and damaged or otherwise defective framing, replace with new framing.

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2. Replace wallboard work that cannot be repaired to conceal defects.
3. Finish touch-up damaged surface finishes.
4. Replace damaged materials and components with New if repair not acceptable to Architect.

3.11 **CLEANING**

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal

3.12 **PROTECTION**

- A. Protect installed Gypsum Board Assembly from subsequent construction operations until date of Final Completion or Owner Occupancy, whichever occurs first.

END OF SECTION

SECTION 09 30 00

TILING

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this Section shall be included in the Tile Filed Sub-Bid. Refer to Section 09 00 02: Tile Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following work:
 - 1. Tile for floor applications.
 - a. Unglazed Ceramic Mosaic Tile (CMT)
 - b. Large Format Tile (LFT)
 - 2. Stone thresholds.
 - 3. Tile for wall applications.
 - a. Glazed Ceramic Wall Tile (GCT).
 - b. Accent Glazed Ceramic Wall Tile (AGCT).
 - 4. Accessories and equipment needed for a complete installation including, but not limited to:
 - a. Ceramic trim pieces.
 - b. Non-ceramic trim.
 - 5. Self leveling underlayments and filler materials for repair of localized surface defects identified by the installer as unacceptable for tile installation.
 - 6. Waterproofing and anti-fracture membranes
 - 7. Mortar
 - 8. Grout
 - 9. Sealants
 - 10. Setting materials
 - 11. Expansion joints

1.03 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 03 30 00 - Cast-In-Place Concrete: Floor tile substrate testing and preparation
 - 2. Section 07 90 05 - Joint Sealers.
 - 3. Section 09 21 16 - Gypsum Board Assemblies: Installation of tile backer board.
 - 4. Section 10 28 00 - Washroom Accessories: equipment installed in tile walls
 - 5. Section 22 40 00 - Plumbing Fixtures: fixtures installed on or in walls or floors that feature tile.

1.04 REFERENCE STANDARDS

- A. Reference Standards the current editions of the following
 - 1. ANSI. American National Standards Institute; www.ansi.org
 - a. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile

- Version.

- b. ANSI A108.1A - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
 - c. ANSI A108.1B - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.
 - d. ANSI A108.1C - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement Mortar.
 - e. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.
 - f. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
 - g. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.
 - h. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.
 - i. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
 - j. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
 - k. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar.
 - l. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.
 - m. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar.
 - n. ANSI A118.5 - American National Standard Specifications for Chemical Resistant Furan Mortars and Grouts for Tile Installation.
 - o. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation.
 - p. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.
 - q. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.
 - r. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.
 - s. ANSI A136.1 - American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile.
 - t. ANSI A137.1 - American National Standard Specifications for Ceramic Tile - Version.
- 2. ASTM. ASTM International; www.astm.org
 - a. D5957 - Standard Guide for Flood Testing Horizontal Waterproofing Installations
 - 3. TCNA. Tile Council of North America, Inc.; www.tileusa.com
 - a. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination per Section 01 31 14, and as follows:
 - 1. Section 10 28 00 - Washroom Accessories: Coordinate installation of accessories into wall tile
- B. Preinstallation Meeting per Section 01 70 00

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
 - 1. Include product data on finishes, protective coatings, use limitation, and recommendations.
 - 2. Submit schedule of proposed installation methods for each room and application according to the TCNA Handbook (HB).
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples: Mount tile and apply grout on three (3) plywood panels, minimum 18 x 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 2 percent percent of each size, color, and surface finish combination. Turn them over in clean marked cartons.
- H. Qualifications Statements: Installer.

1.07 CLOSEOUT SUBMITTALS:

- A. Submittal Procedures: Section 01 78 00
 - 1. Warranty Documentation: Executed warranty.
 - 2. Operation and Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.08 QUALITY ASSURANCE

- A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.
- B. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.
- C. Single Source Responsibility:
 - 1. Obtain each type and color tile material required from single source.
 - 2. Obtain underlayments, waterproofing/antifracture membranes, setting materials, grouts, sealants, and other tile installation products from a single manufacturer and capable of providing the specified tile system warranty.
 - 3. Obtain prefabricated edge protection and transition and movement profiles from one manufacturer to ensure compatibility.
 - 4. Obtain membrane from same manufacturer as setting material or from manufacturer approved by setting material manufacturer to ensure compatibility and warranty requirements are met.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, the TCNA (HB), Section 01 60 00, and as follows:
 - 1. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.10 FIELD CONDITIONS

- A. Ambient Conditions: Maintain ambient and substrate temperature of a minimum 50 deg F during installation of mortar materials and for 7 days after completion.
 - 1. Temporary heaters, if used, shall vent to the outside to eliminate possible carbon dioxide damage to new tile

work and to workers.

1.11 WARRANTY

- A. Manufacturer / Special Warranty: Prepare and submit in accordance with Section 01 78 00 - Closeout Submittals.
 - 1. Tile Installation System: Provide a written 25 year full system written warranty that each tile assembly used is free from manufacturing defects and the component products will not break down or deteriorate when installed in accordance with the manufacturer's written specifications and guidelines. Warranty shall be issued upon completion of the work, and begin on the date of Substantial Completion.
 - 2. Tiles: Provide manufacturer's standard material warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with the requirements of this section, provide tile products from one of the following manufacturers:
 - 1. Basis of Design: Daltile Corporation; materials as identified in Index of Finishes in drawings.
 - 2. Crossville Ceramics; www.crossvilleinc.com.
 - 3. American Olean; www.americanolean.com
 - 4. Florida Tile, www.floridatile.com
 - 5. Porcelanite, Inc.; Lexington, NC; (336) 249-3931
 - 6. Graniti Fiandre; www.granitifiandre.com
- B. Subject to compliance with the requirements of this section, provide tile setting systems from one of the following manufacturers:
 - 1. Basis of Design: Laticrete.
 - 2. Bostik.
 - 3. Merkrete.
- C. Substitution Limitations: See Section 01 60 00, Product Requirements.

2.02 REGULATORY REQUIREMENTS:

- A. General: Manufactured tile shall conform with ANSI A137.1 with respect to abrasive wear, water absorption, bonding capability, thickness, facial dimensions, facial warpage, wedging, crazing, breaking strength and thermal shock, unless otherwise indicated.
- B. Tile Flooring Surfaces: Static Coefficient of Friction per ANSI A1264.2
- C. Provide materials obtained from only one source, manufactured under TCNA license to insure consistent quality and compatibility.

2.03 TILE MATERIALS

- A. Glazed Wall Tile Type (GCT): ANSI A137.1, and as follows:
 - 1. Basis of Design Product: Daltile Composition CP03 "Canvas Gloss".
 - 2. Size and Shape: 4 inches by 8 inches.
 - 3. Thickness: 3/8 inch.
 - 4. Edges: Cushioned.
 - 5. Surface Finish: Semi-gloss.
 - 6. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.
- B. Large Format Tile Type LFT: ANSI A137.1, and as follows:
 - 1. Basis of Design Product: Daltile; Invoke ID01 "Sheer Glow".
 - 2. Size and Shape: 12 inches by 12 inches.
 - 3. Thickness: 1/2 inch

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4. Edges: Square.
5. Surface Finish: Natural matte; unpolished (UPS).
6. Wet COF (ASTM C1028): greater than .42 when used as flooring.
7. Moisture Absorption: less than 0.5 percent.
8. Color(s): As scheduled.
9. Trim Units: Matching cove base shapes in 6 by 24 inch with bullnose top.. Provide preformed inside and outside corners.

2.04 TRIM AND ACCESSORIES

- A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
 1. Applications: Use in the following locations:
 - a. Open Edges: Bullnose.
 - b. Inside Corners: Jointed.
 - c. Floor to Wall Joints: Cove base.
 2. Manufacturer: Same as for tile.
- B. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
 1. Basis-of-Design Products: Schluter-Systems, or equal
 - a. Porcelain Tile to CPT and RSF = RenoTK ETK100
 2. Applications: Use in the following locations:
 - a. Open edges of floor tile.
 - b. Transition between floor finishes of different heights.
- C. Thresholds: Marble, white, honed finish; 5 inches wide by full width of wall or frame opening; 1/2 inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.
 1. Applications: Provide at the following locations:
 - a. At doorways where floor tile meets different floor finish.

2.05 SETTING MATERIALS

A. SETTING MATERIALS

1. Subject to compliance with the requirements of this section, provide materials from one of the following manufacturers:
 - a. Basis of Design: Laticrete International.
 - b. Bostik, Inc: www.bostik-us.com.
 - c. Custom Building Products: www.custombuildingproducts.com.
 - d. Mapei Corporation ; www.mapei.com
 - e. Kaiser Building Products; www.kaiserbuildingproducts.com
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
 1. Application(s): Use this type of bond coat for glazed, unglazed, and quarry type floor and wall tile, except as noted below.
 2. Basis of Design Products:
 - a. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com or equal.
- C. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.

1. Applications: Food processing areas and commercial kitchen floors, and stone saddles.
2. Products:
 - a. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com.
- D. Gypsum Wallboard Organic Adhesive: ANSI A136.1 Type I or Type II TCNA W223
 1. Basis-of-Design Products: Laticrete #15 Multi Mastic or equal
- E. Organic Adhesive: ANSI A136.1, thinset mastic type.
 1. Applications: Thinset wall tile..
 2. Use Type I in areas subject to prolonged moisture exposure.
 3. Products:
 - a. LATICRETE International, Inc; LATICRETE 15 Premium Mastic: www.laticrete.com.

2.06 GROUTS

- A. Provide grouts from same manufacturer as setting materials and other tile installation products.
- B. Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Color(s): As selected by Architect from manufacturer's full line.
 4. Products:
 - a. LATICRETE International, Inc; LATICRETE PermaColor: www.laticrete.com.

2.07 ACCESSORY MATERIALS

- A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Provide materials from same manufacturer as setting materials and grouts.
 2. Type: Fluid-applied.
 3. Material: SBS rubber, with polyester fabric reinforcing at edges, corners, joints, and cracks.
 4. Thickness: 0.020 inch thick, minimum
 5. Provide at all tile floors with floor drains at elevated slabs.
 6. Basis-of-Design Products: Laticrete #9235 or equal.
- B. Waterproofing Membrane at Showers and Tiled Tubs: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Type: Fluid-applied.
 2. Material: SBS rubber.
 3. Thickness: 25 mils, minimum, dry film thickness.
 4. Products:
 - a. LATICRETE International, Inc; LATICRETE Hydro Ban: www.laticrete.com.
- C. Underlayment at Floors: Specifically designed for bonding to thin-set setting mortar; not primarily a waterproofing material and having the following characteristics:
 1. Crack Isolation: Comply with ANSI A118.12.
 2. Water Resistance: Comply with ANSI A118.10, bonded waterproofing.
 3. Uncoupling Function: Allow for separation between membrane and the mortar adhering tile to the membrane when subjected to excessive substrate movement.
 - a. The General Contractor shall cover costs for labor and materials of this product should subfloor require its use to achieve an acceptable substrate per tile manufacturer's recommendations.

- b. Basis-of-Design Product: Laticrete HydroBan or equal.
 - c. Suitable for installation over green concrete.
 - d. Type: Fluid-applied.
4. Do Not Use: Gypsum or cementitious based self-leveling underlayment.
- D. Sealants
- 1. Provide sealants from same manufacturer as setting bed and grouts.
 - 2. High performance, one component, neutral cure, 100% silicone sealant designed for ceramic tile & stone applications.
 - 3. Color to match grout color.
 - 4. Provide sealants at expansion joints at expansion joints and where tile abuts perpendicular surfaces and dissimilar materials
- E. Expansion Joints:
- 1. Flexible and compressible back-up strip of closed cell foam polyethylene, butyl rubber, or open cell and closed cell polyurethane, rounded at surface to contact sealant, as shown on the details and as recommended by sealant manufacturers. Fit neatly without compacting and to such a height to allow sealant depth of half of joint. Sealant must not bond to back-up material.
 - 2. Width (vertical and Horizontal)
 - a. Ceramic Mosaic and Glazed Wall Tile: Preferred not less than 1/4 inch and not less than 1/8 inch.
 - 3. Preparation
 - a. Edges to be clean and dry. Sand or grind for optimum bond.
 - b. Primer when recommended by sealant manufacturer on edges. Keep primer off face of tile.
 - 4. Location
 - a. Where tile abuts restraining surfaces such as perimeter walls dissimilar floors, curbs, columns, pipes, ceilings, and where changes occur in backing materials.
 - b. All expansion, control, construction, cold, and seismic joints in the structure shall continue through the tile work including such joints as vertical surfaces.
 - c. Joints through tile work directly over structural joints must never be narrower than the structural joint.
 - 5. Follow TCNA Joint Design Essentials EJ171.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
- 1. Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - 2. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
 - a. Flatness for floor: 1/4 inch in 10 feet and 1/16 inch in 1 foot from the required plane
 - 3. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
 - a. Flatness for walls: 1/4 inch in 8 feet.
 - 4. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
 - 5. Preinstallation Testing: Substrates surfaces will be tested to verify that bond is not impaired. Abrade, treat or otherwise prepare surface to ensure bonding using manufacturer recommended methods.

- a. Do not install tile until Owner engaged Independent Testing Agency testing results show:
 - 1) Tile and setting material manufacturer's recommended moisture emission rate and alkalinity requirements of the slab.
 - b. If concrete is found to be unacceptable substrate for tile work, this contractor shall notify General Contractor and Architect. General Contractor shall make repairs as required to meet the recommendations of the tile and setting materials. This contractor shall not continue with work until substrate is acceptable as required by manufacturer of tile and setting materials. Starting of installation constitutes acceptance of surfaces.
6. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protection of in-place conditions. Protect surrounding work from damage.
- B. Surface Preparation: Refer to manufacturer's instructions and recommendations for preparation of substrates.
 1. Vacuum clean surfaces and damp clean.
 2. Seal substrate surface cracks with a cementitious-based or epoxy-based filler.
 3. Level existing substrate surfaces to acceptable flatness tolerances with a cementitious-based leveling material or by grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended to include full range within each carton. If not, blend tile on site prior to setting tile.
- D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and The Tile Council of North America Handbook recommendations and as follows:
 1. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
 2. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
 3. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
 4. Form internal angles square and external angles bullnosed.
 5. Install non-ceramic trim in accordance with manufacturer's instructions.
 6. Install thresholds where indicated.
 7. Sound tile after setting. Replace hollow sounding units.
 8. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
 9. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
 10. Grout tile joints. Use standard grout unless otherwise indicated.
 11. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
 1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.

3.05 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION

- A. Provide at all elevated slabs floors containing floor drains.
- B. Install waterproofing to comply with ANSI A108.10 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

- C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight

3.06 INSTALLATION - WALL TILE

- A. Over coated cement backer board on studs, install in accordance with TCNA (HB) Method W245.

3.07 FIELD QUALITY CONTROL

- A. Maintain and reference one complete copy of TCNA Handbook and ANSI A108 Series/A118 Series on site.
 - 1. Be sure cut edges are clean before installing tiles, fit tile carefully against trim, around pipes, electrical boxes and other built in fixtures so that escutcheons, plates and collars will completely overlap cut edges.
 - 2. When using glazing tile sheets, minimize tearing sheets apart by drilling pipe holes as much as possible.
 - 3. Near floor drains, keep tile floor level, dishing slightly only in area of drain.
- B. Field Tests and Inspections the as follows:
 - 1. Interior Floor Waterproofing: Flood test critical areas per ASTM D 5957 for plaza decks, and floors and showers where slope does not exceed 1/4 inch per foot, and as directed by the Architect.
 - a. Cure Time: 7 days at 70 deg F prior to flood test.
- C. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items prior to inspection for Substantial Completion.
 - 1. Replace damaged materials or items with New if repair not acceptable to Architect.

3.08 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal
- B. Clean tile surfaces as thoroughly as possible on completion of grouting.
 - 1. Remove all grout haze, observing tile manufacturer's recommendations as to use of cleaners.
 - 2. Do not use acids.
 - 3. Rinse tile work thoroughly with clean water before and after using chemical cleaners.
 - 4. Polish surfaces of glazed tile work with soft cloth

3.10 PROTECTION

- A. Protect installed [work] from subsequent construction operations until date of Final Completion or Owner Occupancy, whichever occurs first.
- B. Do not permit traffic over finished floor surface for four (4) days after installation.
- C. Where traffic is unavoidable, place large flat boards in walkways and wheel ways for seven (7) days.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this Section shall be included in the Acoustic Ceilings Filed Sub-Bid. Refer to Section 09 00 03: Acoustic Ceilings Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Furnishing, delivering, erecting and installing the following work:
 1. Suspended metal grid ceiling system.
 2. Acoustical units.
 3. Supplementary acoustical insulation above ceiling.
 4. Trim, perimeter angles, and other accessories needed for a complete installation.

1.03 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 1. Section 04 20 00 - Unit Masonry
 2. Section 07 90 05 - Joint Sealers: Acoustic and other sealants.
 3. Section 09 21 16 - Gypsum Board Assemblies.
 4. Section 09 90 00 - Painting and Coating.
 5. Division 21 Fire Protection sections: Sprinklers and other equipment in or above ceilings.
 6. Division 23 HVAC sections: Diffusers and grilles in acoustic ceilings.
 7. Division 26 Electrical sections: Lights, motion and occupancy sensors, alarms, and other devices in acoustic ceilings.

1.04 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 1. ASCE. American Society of Civil Engineers; www.asce.org
 - a. ASCE 7 - Minimum Design Loads for Buildings and Other Structures
 2. AISI. American Iron and Steel Institute; 2001 with 2004 supplement.
 - a. North American Specification for the Design of Cold-Formed Steel Structural Members.
 3. ASTM. ASTM International; www.astm.org
 - a. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - b. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 - c. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
 - d. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,

Profiles, and Tubes; 2013.

- e. ASTM E 84 - Surface Burning Characteristics of Building Materials
 - f. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
 - g. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
4. ICC. International Code Council; www.iccsafe.org
- a. IBC. International Building Code - Category D Seismic Construction requirements for suspended Ceilings.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling per Section 01 32 16, and as follows:
- 1. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
 - 2. Do not install acoustical units until after interior wet work is dry.

1.06 SUBMITTALS

- A. Construction Submittals
- 1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
 - 2. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, mechanical and electrical items installed in the ceiling, and seismic braces, compression resistant hangers, and other ceiling mounted equipment or devices. Indicate cut tile locations and working points within each space.
 - 3. Product Data: Submit manufacturer's printed product literature including dimensions, style, perforation patterns, products standards, acoustical tile materials, suspension system components, finishes, installation instructions, use limitations, and recommendations.
 - 4. Samples: Submit two samples 6 x 6 inch in size illustrating material and finish of acoustical units.
 - 5. Samples: Submit three samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.
- B. Closeout Submittals
- 1. See Section 01 78 00 - Closeout Submittals for procedures, and as follows:
 - a. Warranty Documentation: Executed warranties.
- C. Maintenance Materials Submittals:
- 1. Extra materials: Acoustical units, quantity equal to 5 percent of total installed for each type.

1.07 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of experience.
- C. Installer Qualifications: Company with a minimum of three years experience specializing in work of the type required by this section.
- D. Single Source Responsibility: Furnish system materials from one manufacturer for entire Project, unless otherwise acceptable to Architect.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements and submittal instructions and the following:
- 1. Materials and Workmanship Warranties: Provide 30 year System Warranty to withstand conditions up to 104

degrees F/95 percent relative humidity without visible sag when used with the manufacturer's required suspension system issued by the manufacturer upon completion of the work and beginning on the date of Substantial Completion.

1.09 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.
- B. Area to receive ceiling or wall system shall be protected from the weather.
- C. Wet trades work shall be complete and dry prior to installation of ceiling system.
- D. Installation shall not proceed until the temperature and humidity conditions closely approximate finish
- E. conditions.
- F. Heating and air-conditioning systems shall be operating prior to and during installation.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS AND SUSPENDED METAL GRID CEILING SYSTEMS

- A. Manufacturers:
 - 1. Subject to compliance with requirements of this specification, provide products from one of the following manufacturers:
 - a. Basis of Design: Armstrong World Industries, Inc: www.armstrong.com.
 - b. CertainTeed Corporation: www.certainteed.com.
 - c. USG: www.usg.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Regulatory Requirements:
 - 1. Acoustical materials and suspension systems shall be installed in accordance with the manufacturer's recommendations and in compliance with seismic category as indicated on structural drawings.
 - 2. Acoustical materials and suspension systems shall be installed in accordance with the IBC, MSBC (780 CMR) and ASCE 7
 - 3. Provide acoustical units with a flame spread of 25 or less and smoke development of 50 or less when tested in accordance with ASTM E 84, Class 1.
- C. Acoustical Units - General: ASTM E1264, Class A.
- D. Performance / Design Criteria:
 - 1. Design Components to ensure light fixtures will not induce eccentric loads. Where components may induce rotation of ceiling system components, providing stabilizing reinforcement.
 - 2. Installed Ceiling System:
 - a. Exhibit maximum deflection of 1/360 of span

2.02 MATERIALS - ACOUSTICAL UNITS

- A. Acoustical Panels : Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
 - 1. Size: 24 x 24 inches.
 - 2. Thickness: 5/8 inches.
 - 3. Composition: Wet felted.
 - 4. Light Reflectance: .85 percent, determined as specified in ASTM E1264.
 - 5. NRC: .55, determined as specified in ASTM1264.
 - 6. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E1264.
 - 7. Edge: square
 - 8. Surface Color: To be selected by Architect from manufacturer's standard line.

9. Basis-of Design Product: Fine Fissured by Armstrong Ceilings.
10. Suspension System: Exposed grid Type 1.

2.03 SUSPENSION SYSTEM(S)

- A. Manufacturers:
 1. Same as for acoustical units.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- C. Exposed Steel Suspension System Type 1: Formed galvanized steel, commercial quality cold rolled; heavy-duty.
 1. Profile: Tee; 15/16 inch wide face.
 2. Construction: Double web.
 3. Finish: Baked polyester paint, color to be selected from manufacturer's standard range of available colors..
 4. Basis of Design Product: Prelude ML by Armstrong.
- D. Exposed Steel Suspension System Type 2: Formed galvanized steel, commercial quality cold rolled; heavy-duty with
 1. Profile: Tee; 15/16 inch wide face.
 2. Construction: Double web with 18 gauge hold down clips.
 3. Finish: Powder coated finish, color to be selected from manufacturer's standard range of available colors..
 4. Provide grid clip wall attachments.
 5. Basis of Design Product: Prelude XL by Armstrong.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
- C. Touch-up Paint: Type and color to match acoustical and grid units.

2.05 SECURITY CEILING ASSEMBLIES (ACP-5A)

- A. Manufacturers and Products:
 1. Accurate Perforating Company Inc, Chicago, Illinois/ Metal security wall panels.
 2. Armstrong/ Secure Lock
 3. Trussbilt; <http://www.trussbilt.com/> Truss Deck
- B. Suspension System for Security Ceiling Assemblies:
 1. Mid-span support member shall be made from two 14-gauge C-channels that are welded together and supported from existing structure by not less than 12-gauge hanger wire, wrapped tightly for three full turns and spaced not more than 48" along the component length. Mid-span support member shall be finished to match panel.
 2. Support struts of not less than 16-gauge c-channels shall be tightly secured to the hanger wires by means of tie wire and shall extend the entire length of the hanger wire from structure to mid-span support to prevent uplift.
 3. Moldings shall be manufactured from 14-gauge galvanized steel and shall be securely fastened to wall surfaces with drilled-in anchors at 24" centers. Molding shall be finished to match panels. Hold-down clips made of 14-gauge steel shall secure the plank tightly within the molding. Optional L-molding with two security screws on each end of the panels.

4. Fasteners and hardware shall be galvanized steel or other noncorrosive material. Security fasteners spaced 6" on center will be utilized where access panels are required.
- C. Access Panels:
1. Entire ceiling or system shall be accessible. Accessibility to be accomplished by removing a complete ceiling panel module.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
1. Carefully examine installation areas with Installer present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, substrates, structural support, utility connections, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - b. Verify that layout of hangers will not interfere with other work.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. General: Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, ASCE 7, Drawings and as follows:
1. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
 - a. Provide seismic bracing with diagonal wire hangers at each room exceeding 750 SF and as required by building codes.
 - b. Locate system on room axis according to reflected plan.
 2. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
 3. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 4. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
 5. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
 6. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
 7. Do not eccentrically load system or induce rotation of runners.
 8. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - a. Use longest practical lengths.
 - b. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. General: Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, ASCE 7, Drawings and as follows:
1. Install acoustical materials and suspension systems in accordance with UL Fire Resistance Rating Design Number for roof/ceiling assembly indicated on Drawings.
 2. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
 3. Fit border trim neatly against abutting surfaces.

4. Install units after above-ceiling work is complete.
5. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
6. Cutting Acoustical Units:
 - a. Cut to fit irregular grid and perimeter edge trim.
 - b. Make field cut edges of same profile as factory edges.
 - c. Double cut and field paint exposed reveal edges.
7. Place acoustical insulation on top of ceiling panels at locations indicated in drawings.
8. Install hold-down clips on panels within 20 ft of an exterior door and at detention ceilings
9. Locate ceiling access panels directly under the items that require access, and as indicated.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items prior to inspection for Substantial Completion.
 1. Replace damaged materials and components with New if repair not acceptable to Architect

3.05 SUSPENSION SYSTEMS

- A. Install per reviewed shop drawings.
- B. Do not attach or pass hangers through mechanical ductwork or attach to electrical conduit.
- C. Where mechanical and electrical work interferes with regular spacing of structural hangers, provide additional hangers, and make necessary adjustments in ceiling construction.
- D. Maximum hanger splay away from vertical: 6 inches per 4 feet.
- E. Mechanical units and electrical fixtures are to be independently supported by the respective mechanical and electrical subcontractors.

3.06 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal
- B. Following installation, clean dirty discolored surfaces of acoustical units and leave them free of defects.

3.07 PROTECTION

- A. Protect installed work from subsequent construction operations until date of Substantial Completion or Owner Occupancy, whichever occurs first..

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this Section shall be included in the Resilient Flooring Filed Sub-Bid. Refer to Section 09 00 05: Resilient Flooring Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Fabrication, furnishing, delivering, and installing the following work:
1. Resilient tile flooring.
 2. Static control resilient tile flooring.
 3. Integral resilient flooring covered base at sheet vinyl floors and carpeted areas .
 4. Resilient stair accessories.
 5. Installation accessories, including but not limited to floor and wall base adhesives; resilient transition strips.

1.03 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
1. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.
 2. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

1.04 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
1. ASHRAE. American Society of Heating, Refrigerating, and Air-Conditioning Engineers; www.ashrae.org
 - a. ANSI / ASHRAE 55, Thermal Environmental Conditions for Human Occupancy
 2. ASTM. ASTM International; www.astm.org
 - a. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 - b. ASTM F1344 - Standard Specification for Rubber Floor Tile.
 - c. ASTM F1861 - Standard Specification for Resilient Wall Base.
 - d. ASTM F2034 - Standard Specification for Sheet Linoleum Floor Covering.
 - e. F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
 3. BAAQMD. Bay Area Air Quality Management District; www.baaqmd.gov
 - a. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov.
 4. FS. Federal Specifications and Standards; www.everyspec.com/FED+SPECS
 - a. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Federal Specifications and Standards.
 5. GS. Green Seal; www.greenseal.org
 6. NFPA. National Fire Protection Association; www.nfpa.org

- a. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association.
- b. NFPA 258, Research Test Method for Determining Smoke Generation of Solid Materials
- 7. OTC (VOC limits). Ozone Transport Commission; www.OTCAIR.org
- 8. SCAQMD. South Coast Air Quality Management District; www.aqmd.gov

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination per Section 01 31 14
- B. Preinstallation Meeting required per Section 01 70 00
- C. Sequencing and Scheduling per Section 01 32 16

1.06 SUBMITTALS

- A. Construction Submittals:
 - 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - 2. Product Data: Submit manufacturer's printed product literature including products standards, identifying materials, components and systems, performance criteria, finishes, use limitations, preparation and installation recommendations, and initial maintenance protective coating and cleaning recommendations, and the following:
 - a. Typical section details indicating each specified system on proposed substrates and transitions to other flooring systems.
 - b. Typical sections indicating flooring system abutting walls.
 - 3. Shop Drawings: Submit drawings showing plans, illustrative seams, patterns, location and types of transition strips.
 - 4. Samples:
 - a. Initial for Selection: Submit printed color charts, sample chains or Architectural Binder indicating manufacturer's complete range to determine color, pattern, and/or composition for each type of material finish exposed to view.
 - b. Final Selection: Submit three representative samples of each product specified, 12 x 12 inch in size, of each different type, color and pattern selected for acceptance.
- B. Closeout Submittals:
 - 1. Submit in accordance with section 01 70 00 - Execution and Closeout Requirements; Section 01 78 00 - Close out submittals.
 - a. Warranty Documentation: Manufacturers' executed material warranties and installers workmanship warranty.
 - b. Operation and Maintenance Data Including methods for maintaining installed products, maintenance product recommendations, related product data and MSDS sheets, directions for product use and performance.

1.07 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Materials: Submit no less than five (5%) percent additional full and unopened rolls or cartons of each color and pattern in each different material installed under this Section, packaging each type of material separately, distinctly marked, and adequately protected against deterioration.

1.08 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - a. Critical Radiant Flux Classification: Class I; not less than 0.45 W/cm²
 - b. Smoke Density per ASTM E662 or NFPA 258: 450 or less

- B. Manufacturer: A firm experienced a minimum five (5) years in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- C. Single Source Responsibility: Obtain primary resilient sheet flooring materials through one source from a single manufacturer.
 - 1. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- D. Field Samples per Section 01 40 00: Provide field samples, dry laid, to demonstrate aesthetic effects of materials in situ, assisting the Architect and Owner in making final selections.
 - 1. Minimum Layout Size: 25 sf (2.3m²)

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, Section 01 60 00, and as follows:
 - 1. Protect roll materials from damage by storing on end.
 - 2. Store base material unrolled and flat.

1.10 FIELD CONDITIONS

- A. Conditions and Measurements: Visit jobsite to verify installation conditions and floor measurements.
- B. Ambient Conditions per manufacturer's written recommendations, SECTION 01 70 00, and as follows:
 - 1. New concrete slabs shall be flat, clean and dry.
 - 2. Environmental Limitations: Do not deliver or install until building is enclosed, wet and overhead work is complete and HVAC system has been operating a minimum two (2) week, consistently maintaining temperature and RH at occupancy levels per ANSI / ASHRAE 55-2004 (Figure 5.2.1.1.), per manufacturer's recommendations.
 - a. Maintain temperature and humidity at occupancy levels.
 - 3. Acclimate product to installation location.
 - a. Deliver materials to jobsite room in which it will be installed 48 hours before installation.
 - b. Maintain Temperature: Minimum 65 deg F (18 deg C), and maximum 80 deg F (26.7 deg C) for twenty-four (24) hours prior to and during Installation
 - 1) Thereafter, maintain minimum temperature of 55 deg F (13 deg C).
 - c. Maintain Humidity: 25 to 60 percent RH prior to and during Installation.

1.11 WARRANTY

- A. Manufacturer Warranty: Prepare and submit in accordance with Section 01 78 00 - Closeout Submittals.
 - 1. Resilient Sheet Flooring: Provide manufacturer's limited warranty stating sheet flooring is guaranteed to be free from wear-through due to normal use in light industrial and commercial applications.
 - a. Warranty Period: Ten (10) years from date of Substantial Completion Substantial Completion.

PART 2 PRODUCTS

2.01 SHEET FLOORING

2.02 TILE FLOORING

- A. Vinyl Composition Tile (VCT): Homogeneous, with color extending throughout thickness, and:
 - 1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 - 3. Size: 12 x 12 inch.
 - 4. VOC Content: As specified in Section 01 61 16.
 - 5. Thickness: 0.125 inch.

6. Color and Pattern: as selected by Architect from manufacturer's full range in patterns indicated on floor plans.
7. Manufacturers:
 - a. Basis -of Design Product and Manufacturer: Excelon 12 by 12, by Armstrong (www.armstrong.com) (www.mannington.com/commercial), or an Architect acceptable equivalent product subject to compliance with requirement from one of the following manufacturers:
 - 1) Mannington Mills, Inc.: www.mannington.com/commercial.
 - 2) Johnsonite, Inc. .: www.johnsonite.com
 - 3) Azrock; www.azrock.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 STAIR COVERING

- A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness; integral nosing not less than 1-5/8 inch deep.
 1. Minimum Requirements: Comply with FS RR-T-650 requirements corresponding to type specified.
 2. Nominal Thickness: 0.1875 inch.
 3. Nosing: Square.
 4. Style: Contrasting color abrasive grit strips full width.
 5. Color: to match raised rubber tile.
 6. Manufacturers: Same as Raised Rubber Tile
- B. Stair Risers: Full height and width of tread in one piece, matching treads in material and color:
 1. Thickness: 0.080 inch.
 2. Manufacturers: Same as Raised Rubber Tile

2.04 RESILIENT BASE

- A. Resilient Base (RB-1): ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows (This section is responsible for furnishing and installing base at all carpeted areas:
 1. Height: 4 inch.
 2. Thickness: 0.125 inch thick.
 3. Finish: Satin.
 4. Length: Roll.
 5. Color: to be selected by Architect from manufacturer's full range.
 6. Accessories: Premolded external corners and end stops.
 7. Manufacturers:
 - a. Basis-of-Design Manufacturer / Product: Johnsonite, Inc.: www.johnsonite.com, or an Architect acceptable equivalent products subject to compliance with requirements from one of the following manufacturers:
 - 1) Burke Flooring: www.burkemercer.com.
 - 2) Roppe Corp: www.roppe.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

- A. Adhesives: Solvent-free, low odor, acrylic based, pressure sensitive, water-resistant type as recommended by resilient sheet flooring manufacturer to suit resilient sheet flooring product and substrate conditions indicated.
 1. Adhesive - Manufacturers List: Subject to compliance with requirements, provide one of the following products:

- a. Spray Adhesive - Spray Smart Flooring Adhesive by Tarket; www.tarkett-commercial.com
 - b. Spray Adhesive - Spray-Lock™ by Interlock Industries, Inc.; www.spray-lock.com
 - c. Troweled Adhesive: Type as recommended by resilient flooring manufacturer for installation.
 - d. Substitution Limitations: See Section 01 60 00, Product Requirements.
- B. Primers: Solvent-free, low odor type as recommended by resilient flooring manufacturer for installation.
 - C. Seaming Materials: Type as recommended by resilient flooring manufacturer for installation.
 - 1. Color: As selected by Architect from flooring manufacturer's complete range of standard and custom colors.
 - D. Cants: for forming coved base with sheet vinyl flooring material, as recommended by flooring manufacturer.
 - E. Moldings, Transition and Edge Strips: Shapes and profiles as indicated on the Drawings; Same manufacturer as base.
 - F. Tools and Equipment: Trowels, rollers, trimmers, and heat welding tools as required for a proper installation.
 - G. Copper Grounding Strips: Type and size as recommended by static control flooring manufacturer.
 - H. Filler for Coved Base: Plastic.
 - I. Cleaner: Neutral, as recommended or approved by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00, Section 01 70 00, and as follows:
 - 1. Acceptance of Conditions: Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, surfaces, substrates, deflection, tolerances, levelness, plumbness, temperature, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - 1) Verify that substrate is flat to within 1/8 inch in 10 feet (4.69mm in 3m) per ASTM F710.
 - 2) Floor slabs are treated with moisture vapor reduction admixture. Slab moisture and humidity testing is not required.

3.02 PREPARATION

- A. Surface Preparation: Refer to manufacturer's instructions and recommendations, Section 01 40 00, and Section 01 70 00, and as follows:
 - 1. Prepare substrates to ensure proper adhesion of the resilient flooring system.
 - 2. Concrete Substrates: Prepare according to ASTM F710.
 - a. Verify the substrate is permanently dry, clean, smooth, and structurally sound.
 - 1) Substrate shall also be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation or laitance, mold, mildew, and other foreign materials that might prevent adhesive bond.
 - b. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, silicone, or curing compounds using mechanical methods recommended by manufacturer.
 - 1) Use only non-chemical mechanical methods, such as bead blasting or abrasive cleaning, to completely remove bond breaker materials from the concrete surface.
 - 2) Removal procedures shall be completed a minimum 48 hours prior to starting concrete testing.
 - 3) Sweep and vacuum substrate just prior to installation.
 - 3. Wood Substrates and Exterior Panel Type Underlayment. Prepare and install per PS1, PS2, APA Form L335.
 - 4. Expansion joints, isolation joints or other moving joints in concrete shall not be filled with patching compound nor covered with resilient flooring.

SECTION 09 65 00 5

5. Sweep and vacuum clean flooring substrates immediately prior to installation of resilient sheet flooring

3.03 INSTALLATION

- A. General: Install Resilient Flooring and Accessories according to the Drawings, approved submittals, manufacturer's instructions, Section 01 70 00, and as follows:
 1. Starting installation constitutes acceptance of sub-floor conditions.
 2. Install in accordance with manufacturer's instructions.
 3. Spread only enough adhesive to permit installation of materials before initial set.
 4. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 05 26 for grounding and bonding to building grounding system.
 5. Fit joints tightly.
 6. Set flooring in place, press with heavy roller to attain full adhesion.
 7. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
 8. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 9. Resilient Strips: Attach to substrate using adhesive.
 10. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 SHEET FLOORING

- A. Lay out without adhesive, and reverse roll the resilient sheet flooring during acclimation period.
 1. Dry lay the sheet on the floor for 24 hours to ensure the sheet is totally relaxed.
 2. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Unless otherwise indicated on drawings, lay out seams to avoid widths less than 1/3 of roll width; match patterns carefully at seams.
 3. Lay flooring with tightly butted seams, unless recommended otherwise by the flooring manufacturer.
 - a. Use seam sealer as recommended by the manufacturer for specific flooring type.
- B. Cutting: Lay resilient sheet flooring starting at the marked centerline. Cut the sheet closely to the wall using a utility knife.
 1. Leave a 3/16 inch (5mm) gap at all inside and outside corners.
 2. Double cut sheet at seams.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings.
 1. Extend resilient sheet flooring to center of door openings.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on sheet flooring as marked on substrates.
 1. Use chalk or other non-permanent, non-staining marking device.
- E. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of adhesive and resilient sheet flooring.
 1. Do not saw-cut joints after installing resilient flooring.
- F. Do not fill movement joints with patching compound or cover with resilient flooring.
 1. Install movement joint systems per manufacturers instructions.
- G. Spray-Applied Adhesive Method:
 1. Do not place finish-flooring product until adhesive applied to substrate is ready to receive it per adhesive manufacturer's instructions.

2. Mark floor equivalent to manufacturer's recommended area for size of container used. Apply no more or less adhesive than what manufacturer recommends.
 3. Outline perimeter of the room with a 4-5 inch (100mm to 125mm) wide band of adhesive. Apply the adhesive from 8-12 inches (200mm to 300mm) above the substrate.
 4. Lay flooring finish material, adjust and reset until layout placement is certain.
 5. Following installation of finish flooring (typically within an hour after installing) roll entire floor area with a 75 to 100 lb (34 to 45 kg) roller to ensure proper bonding with instant shear strength.
 6. Close space to traffic for 2 hours before beginning installation, however, flooring is immediately available after rolling for all range of use.
- H. Trowel Adhesive Method: Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate with a trowel to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.
1. Allow adhesive to set-up.
 2. Roll the flooring within an hour after placing the flooring into the adhesive bed.
 - a. Roll the seam area using a hand roller.
 - b. Roll the floor in both directions, with a 100 lb three-section roller overlapping the previous rolled area by 1/2 of the width of the roller.
 3. Protect flooring from foot traffic for 12 hours before and after installation per adhesive manufacturer's instructions to allow proper set up time.
 - a. Keep furniture, fixtures, and rolling traffic off the floor for 48 hours.
- I. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

3.05 STATIC DISSIPATIVE RESILIENT SHEET FLOORING

- A. Install with adhesive as recommended in manufacturer's Installation Instructions for conductive flooring and specified for the site conditions and follow adhesive label for proper use.
- B. Install with copper grounding strips per manufacturer's installation instructions.
- C. Weld all seams in flooring using cold or heat weld process.

3.06 TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

3.07 RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.08 STAIR COVERINGS

- A. Install stair coverings in one piece for full width and depth of tread.
- B. Adhere over entire surface. Fit accurately and securely.

3.09 FIELD QUALITY CONTROL

- A. Site Tests and Inspections the as follows:
 1. Inspect floor installation for non-conforming work including, but not limited to, the following:
 - a. Improper Substrate Preparation as Indicated by: Buckling or telegraphing; air blisters, buckles, and dirt or debris under the sheet flooring; and Moisture related failures.

- b. Lack of Adequate Adhesion as Exhibited by: Loose edges or seams; Seams peaking; Shrinkage, or wide or too tight joints; or Adhesive oozing or adhesive on top of the flooring
 - c. Damaged sheet flooring as indicated by indentations, splits, cuts, cracks, punctures, melting, or burn marks
 - B. Non-Conforming Work per General Conditions and as follows:
 - 1. Remove, Repair and Reinstall or Restore in Place damaged items.
 - a. Finish touch-up damaged surface finishes.
 - 2. Replace damaged materials or items with New if repair not acceptable to Architect.
- 3.10 **CLEANING**
 - A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal
 - B. Remove excess adhesive from floor, base, and wall surfaces without damage.
 - C. Clean and provide initial maintenance in accordance with manufacturer's instructions.
- 3.11 **PROTECTION**
 - A. Protect installed [work] from subsequent construction operations until date of Substantial Completion or Owner Occupancy, whichever occurs first.
 - B. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following work:
 - 1. Carpet tile, fully adhered.
 - 2. Accessories needed for a complete installation, including primers, adhesives, and resilient transition strips.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 09 65 00 - Resilient Flooring: Termination edging of adjacent floor finish.
 - 2. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.
 - 3. Section 09 65 00 - Resilient Flooring: interface of resilient flooring with carpet tile.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM. ASTM International; www.astm.org
 - a. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
 - b. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 - 2. CRI. Carpet and Rug Institute; www.carpet-rug.org
 - a. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute.
 - b. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute.
 - 3. NFPA. National Fire Protection Association; www.nfpa.org
 - a. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association.
 - 4. OTC (VOC limits). Ozone Transport Commission; www.OTCAIR.org

1.04 SUBMITTALS

- A. Construction Submittals:
 - 1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
 - a. Shop Drawings: Indicate layout of joints.
 - b. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
 - c. Samples: Submit three (3) carpet tiles illustrating color and pattern design for each carpet color selected.
 - d. Qualification Statements: Installer.
- B. Closeout Submittals:

1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements, and Section 01 78 00 - Closeout Submittals.
 - a. Warranty Documentation: Executed warranties.
 - b. Maintenance Data: Include methods for maintaining installed products, maintenance product recommendations, suggested schedule for cleaning, related product data and MSDS sheets, directions for product use.
 - c. Maintenance Materials: provide 5% additional attic stock of material from same dye lot for attic stock and maintenance.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements:
 1. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - a. Critical Radiant Flux Classification: Class I; not less than 0.45 W/cm².
 - b. Smoke Density per ASTM E662 or NFPA 258: 450 or less.
- B. Installer: Perform installation with skilled, experienced and trained workmen supervised by trained personnel who shall have a minimum three (3) years successful experience in installations of similar size and scope.
- C. Single Source Responsibility: Obtain primary carpet flooring materials through one source from a single manufacturer.
 1. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials, unless otherwise specified.
- D. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years experience.
- E. Installer Qualifications: Company specializing in installing carpet with minimum three (3) years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI (CIS), manufacturer's instructions and recommendations, and Section 01 60 00.

1.07 FIELD CONDITIONS

- A. Conditions and Measurements: Visit jobsite to verify installation conditions and floor measurements.
- B. Ambient Conditions per CRI (CIS), manufacturer's written recommendations, SECTION 01 70 00, and as follows:
 1. New concrete slabs shall be flat, clean and dry passing all flooring manufacturers' moisture testing requirements.
 2. Environmental Limitations: Do not deliver or install until building is enclosed, wet work is complete, and HVAC system has been operating a minimum two (2) week, consistently maintaining temperature and RH at occupancy levels per ANSI / ASHRAE 55-2004 (Figure 5.2.1.1.), per manufacturer's recommendations.
- C. Store materials in area of installation for minimum period of 24 hours prior to installation.

1.08 WARRANTY

- A. Manufacturer Warranty: Prepare and submit in accordance with Section 01 78 00 - Closeout Submittals.
 1. Provide manufacturer's standard limited warranty against excessive wear, backing delamination, colorfastness, and edge ravel.
 - a. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer / Product; Milliken Carpets; Product: Lyceum Plato, or an Architect acceptable equivalent subject to compliance with requirements from one of the following manufacturers:
 1. Tandus Modular Tile: www.tandus.com.

2. Interface, Inc: www.interfaceinc.com.
3. Lees Carpets: www.leescarpets.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE / DESIGN CRITERIA

A. Performance Criteria - Carpet:

1. Critical Radiant Flux per ASTM E648 or NFPA 253: Class 1.
2. Surface Flammability Ignition per ASTM D 2859 (pill test): Pass.

2.03 MATERIALS

A. Carpet Tile: (3 Colors as per plans listed as Carpet type 1, Carpet type 2 and Carpet type 3 all from manufacturers standard color range).

1. Tufted Textured Loop.
2. Face Fiber: Type 6/6 nylon.
3. Dye Method: Digital Color Placement.
4. Gauge: 1/10.
5. Stitches per inch: 10.3.
6. Pile thickness: 0.070 inches.
7. Tufts: 103 per square inch.
8. Finished pile height: 0.14 inches.
9. Average density: 7,793.
10. Primary Backing: PVC free high density fiberglass reinforced polyurethane.
11. Tile Size: 39.4 inches X 39.4 inches modular tiles.
12. Installation Method: Ashlar tile.
13. Color: 3 Colors from manufacturers standard product line.

2.04 ACCESSORIES

- A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer and adhesive material manufacturer that meets VOC requirements.
- B. Primer for Substrate: As recommended by adhesive manufacturer for substrate.
- C. Edge Strips: resilient type, color as selected.
- D. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per CRI (CIS), Section 01 40 00, Section 01 70 00, and as follows:
 1. Acceptance of Conditions: Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, surfaces, substrates, utilities, deflection, tolerances, levelness, plumbness, temperature, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - 1) Verify that substrate is flat to within 3/16 inch in 10 feet (4.69mm in 3m) and within the equivalent of 1/32 inch in 12 inches (0.78mm per 0.3m) per ASTM F710.
 2. Test concrete substrates per CRI (CIS), ASTM F 710, and as required by manufacturer to verify that concrete sub-floor surfaces are dry enough and ready for carpet flooring and adhesive materials.
 - a. Perform moisture testing, alkalinity testing to verify pH level, and bond testing to determine compatibility

of adhesive to concrete substrate.

- b. If test results exceed limitation, carpet-flooring installation shall not proceed until corrective action has been completed and new tests are below requirements.
- c. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- D. Cementitious sub-floor surfaces: Concrete slabs are treated with concrete water vapor mitigation admixtures; testing of slabs for moisture and humidity is not required.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Surface Preparation: Refer to CRI (CIS), CRI (GLA), manufacturer's instructions and recommendations, Section 01 40 00, and Section 01 70 00, and as follows:
 - 1. Prepare substrates to ensure proper adhesion of the carpet flooring system.
 - 2. Concrete Substrates: Prepare according to ASTM F710.
 - a. Verify the substrate is permanently dry, clean, smooth, and structurally sound.
 - 1) Substrate shall be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation or laitance, mold, mildew, and other foreign materials that might prevent adhesive bond.
 - b. Minimum Concrete Substrate Requirements:
 - 1) Moisture, mildew and alkali resistant
 - 2) Minimum static loading capacity of 3,000 psi (20.7 MPa)
 - 3) Concrete mix water/cement ratio of less than 0.45
 - 4) Minimum density of 115 pcf (1842 kg/m³)
 - 5) For concrete slabs on grade provide a contiguous vapor retarder directly under the slab a minimum 0.010 inches (0.254mm) thick with a permeance of 0.1 y (perms).
 - c. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, silicone, or curing compounds using mechanical methods recommended by manufacturer.
 - 1) Use only non-chemical mechanical methods, such as steam vacuuming, bead blasting or abrasive cleaning, to completely remove bond breaker materials from the concrete surface.
 - 2) Removal procedures shall be completed a minimum 48 hours prior to starting concrete testing.
 - 3) Sweep and vacuum substrate just prior to installation.
 - d. Fill and patch each construction seam, hole, indentation and irregularity level with the surrounding substrate with Portland cement-based filler.
 - 1) Sand patched areas smooth after material is cured.
 - e. Self-Leveling Underlayments: Provide a dry (less than 4 percent moisture) and smoothly sanded underlayment substrate ready for carpet flooring system installation.
 - 1) Structural Lightweight Concrete or other underlayment compound type shall be moisture, mildew and alkali resistant, and have a minimum static loading capacity of 3,000 psi (20.7 MPa).

3. Prime Substrate: If bond test fails, prepare and apply primer coating using type as recommended by adhesive manufacturer for substrate.
 4. Expansion joints, isolation joints or other moving joints in concrete shall not be filled with patching compound nor covered with carpet flooring.
 5. Sweep and vacuum clean flooring substrates immediately prior to primer installation, and just before installing carpet flooring, after primer has cured. If no primer is used sweep just prior to carpet installation.
- B. Vacuum clean substrate.
- 3.03 INSTALLATION - GENERAL**
- A. General: Install Tile Carpeting and Accessories according to the Drawings, approved submittals, Section 01 70 00, and as follows:
1. Starting installation constitutes acceptance of sub-floor conditions.
 2. Install carpet tile in accordance with manufacturer's instructions and CRI Carpet Installation Standard.
 3. Blend carpet from different cartons to ensure minimal variation in color match.
 4. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
 5. Lay carpet tile in square pattern, with pile direction parallel to next unit, set aligned as indicated on shop drawings.
 6. Locate change of color or pattern between rooms under door centerline.
 7. Fully adhere carpet tile to substrate.
 8. Trim carpet tile neatly at walls and around interruptions.
 9. Complete installation of edge strips, concealing exposed edges.
- 3.04 INSTALLATION ON STAIRS**
- A. Use one piece of carpet for each tread and the riser below. Apply seam adhesive to all cut edges.
- B. Lay carpet with pile direction in the length of the stair.
- C. Adhere carpet tight to stair treads and risers.
- 3.05 CLEANING**
- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
- B. Immediately after carpet installation perform the following operations:
1. Remove excess adhesive without damage, from floor, base, and wall surfaces.
 2. Clean and vacuum carpet surfaces.
- 3.06 PROTECTION**
- A. Protect installed work from subsequent construction operations until date of Substantial Completion or Owner Occupancy, whichever occurs first.
- B. Protect installed work to comply with CRI (CIS) until date of Substantial Completion or Owner occupancy, whichever occurs first.

END OF SECTION

SECTION 09 90 00

PAINTING AND COATING

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this Section shall be included in the Painting Filed Sub-Bid. Refer to Section 09 00 05: Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Furnish all labor, materials and installation of masonry systems as shown on the drawings and/or as specified herein. Includes, but is not limited to, the following items:
 - B. Surface preparation of surfaces to be painted.
 - C. Field application of paints, stains, varnishes, and other coatings.
 - D. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Elevator pit ladder and Flat Roof Service Ladder, Egress Gate.
 - 3. Exterior site features indicated in the drawings to be painted, including but not limited to handrails at site stairs, concrete filled pipe bollards, and other site amenities that do not include a factory finish.
 - 4. Exposed structure at the building interior..
 - 5. Mechanical and Electrical:
 - a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In all areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - E. Do not paint or finish the following items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Non-metallic roofing and flashing.
 - 6. Stainless steel, anodized aluminum, bronze, terne, and lead items.
 - 7. Marble, granite, slate, and other natural stones.
 - 8. Floors, unless specifically so indicated.
 - 9. Ceramic and other tiles.
 - 10. Glass.
 - 11. Acoustical materials, unless specifically so indicated. Concealed pipes, ducts, and conduits.
 - 12. Do not paint over door tags or other objects that bear fire-rating information. Do not paint over tags or plates on mechanical equipment.

F. Additional Provisions:

1. Provide painting and coating finish for each item not finish-painted by the work of other sections.
2. Preparatory work of materials and surfaces to receive painting or finishing beyond that specified to be done as work of other Sections, shall be included as work of the Section.
3. Provide preparation, priming, and painting of all factory primed and/or painted rooftop equipment
4. Surfaces shall be painted or finished except as specifically excluded under the requirements of this Section, regardless of any conflicts which may occur between these requirements and local tradepractice.

1.03 WORK NOT INCLUDED:

- A. Section 06 20 00 - Finish Carpentry: Back priming and transparent finishing of wood. Note that any wood not finished by Division 06 shall be the responsibility of this section, unless noted otherwise.
- B. Section 06 41 00 - Architectural Woodwork: Priming and finishing of wood covered by. Note that any wood not finished by Division 06 shall be the responsibility of this section, unless noted otherwise.
- C. Section 08 14 16 - Flush Wood Doors: Prefinished wood doors.
- D. Divisions 21 through 33: All hidden piping, ducts, and conduit, and where exposed in boiler room and similar utility rooms, or specified to be color coded or so required by applicable code.
- E. All items and equipment with factory finish.
 1. Exceptions:
 - a. Where factory finish is required to be painted out to match adjacent surface finish.
 - b. Section 07 72 00 - Roof Accessories: Rooftop equipment and appurtenances
 - c. Items noted otherwise herein

1.04 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 1. Section 05 12 00 - Structural Steel: compatibility of primers and touch-up of primer and galvanizing following installation.
 2. Section 05 50 00 - Metal Fabrications: compatibility of primers and touch-up of primer and galvanizing following installation.
 3. 0 00 - Finish Carpentry: compatibility of shop-applied primers and back-priming of wood products.
 4. Section 07 72 00 - Roof Accessories.
 5. Section 07 90 05 - Joint Sealers: compatibility of materials with field-applied paint finish.
 6. Section 08 11 13 - Hollow Metal Doors and Frames: compatibility of primers and touch-up of primer and galvanizing following installation.
 7. Section 08 31 00 - Access Doors and Panels: compatibility of primers.
 8. Section 09 29 16 - Gypsum Board Assemblies: Finishing of wall surfaces to receive paint.
 9. Division 32 - Exterior Improvements sections: Field painting and touch-up of any non-prefinished items not intended to be left exposed to view.

1.05 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 1. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings;

- U.S. Environmental Protection Agency.
2. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 3. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
 4. GreenSeal GS-11 - Paints and Coatings.
 5. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings.

1.06 SUBMITTALS

A. Construction Submittals:

1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
 - a. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1) Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2) MPI product number (e.g. MPI #47).
 - 3) Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4) Manufacturer's installation instructions.
 - 5) If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.
 - b. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating selected colors required in each finishing system specified.
 - 1) Where sheen is specified, submit samples in each sheen required for the project.
 - 2) Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
 - 3) Paint color submittals will not be considered until color submittals for major materials not to be painted, such as resilient flooring, wall base, and prefinished components have been approved.
 - c. Samples: Submit three samples of each field-applied stain or clear finish 6 x 9 inches in size, illustrating selected sheen and coloration, prepared on each specified wood substrate indicated.
 - d. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
 - e. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
2. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
3. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - a. See Section 01 60 00 - Product Requirements, for additional provisions.
 - b. Extra Paint and Coatings: 1 gallon of each color; store where directed.
 - c. Label each container with color in addition to the manufacturer's label.

B. Closeout Submittals:

1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements, and Section 01 78 00 - Closeout Submittals.
 - a. Warranty Documentation: Executed warranties.
 - b. Operation and Maintenance Data: Operating, cleaning and maintenance recommendations.
 - 1) Basic owner requirements to maintain warranty
 - 2) Recommended maintenance guidelines and maintenance schedule.
 - c. Sustainable Design Closeout Documentation: Submit completed LEEDTM submittal Worksheet

Templates for the following credits:

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum ten years documented experience.
- B. Single Source Responsibility: Furnish paint materials and products in each paint system from one manufacturer for entire Project.
- C. Notify Architect if specified material does not appear to be comparable with project specific substrate, durability or performance expectations.

1.08 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Provide a 5 feet by 5 feet mock-up of each paint color for walls, for Architect and Owner approval.
- C. Locate where directed by Architect.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- D. Storage space shall be kept clean and neat. Oily rags shall be removed and disposed of each day, and all other necessary precautions shall be taken to avoid fires.
- E. Maintain a fire extinguisher in paint mixing and storage area.

1.10 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
- B. Paints:
 - 1. Basis of Design Manufacturer: See Section 09 91 02.
 - 2. Duron, Inc: www.duron.com.
 - 3. Glidden Professional: www.gliddenprofessional.com.
 - 4. PPG Architectural Finishes, Inc: www.ppgaf.com.
 - 5. Pratt & Lambert Paints: www.prattandlambert.com.
 - 6. Sherwin-Williams Company: www.sherwin-williams.com.

7. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00 – Product Requirements..
- C. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00 – Product Requirements.

2.02 PERFORMANCE / DESIGN CRITERIA

- A. Color and Life of Film: Color of all surfaces finished under this Section shall, at the end of one year, have remained free from fading, and variations and shall be uniform.
 1. All materials shall have their original adherence at the end of one year, and there shall be no evidence of blisters, running, peeling, scaling, caulking, streaks or stains at the end of this period.
 2. Washing with alkali-free soap and water shall remove surface dirt without producing any deterioration effects.

2.03 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers shall be by the same manufacturer as top coat(s) material. Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer. Primers shall be identifiable in the manufacturers product data as comparable with substrate and top coat(s).
- C. Volatile Organic Compound (VOC) Content:
 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of State in which the project is located.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Flammability: Comply with applicable code for surface burning characteristics.

2.04 PAINT SYSTEMS_SEE SECTION 09 91 02

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:

1. Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Gypsum Wallboard: 12 percent.
 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
 5. Concrete Floors and Traffic Surfaces: 8 percent.
 6. Test concrete, masonry and plaster surfaces for alkalinity. Alkalinity shall not exceed each paint manufacturer's recommended pH.
 7. Furnish, maintain and remove all scaffolding, ladders and planks required for this work and all drop cloths for the protection of concrete walks, floors, prefinished materials, building fixtures, etc.
 - a. Painted and finished surfaces subject to damage or defacement due to other work on the building shall be properly protected and covered.
 - b. Contractor shall be responsible for any and all damage to painted work and to that of other work caused by operations under this Section.
- F. Contractor shall be required to replace any unsatisfactory work caused by improper or defective surfaces as directed by the Architect at no additional cost to the Owner.

3.02 PREPARATION

- A. No priming or painting of wood will be permitted on or in building area where unit masonry is being installed or is in the process of drying.
- B. Clean surfaces thoroughly and correct defects prior to coating application.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- D. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather

edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

- L. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- M. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.
- O. Verify paints are comparable with sealants that are intended to be painted.

3.03 APPLICATION

- A. All painting shall be done by skilled and experienced mechanics, working under the supervision of a capable foreman. All materials shall be applied in accordance with the manufacturer's directions and materials shall be thinned only for the proper workability and in compliance with the manufacturer's specifications. All material shall be evenly applied without runs or sagging, and free from drops, ridges, laps and brush marks.
- B. Completed painting sections shall be free of blistering, running, peeling, scaling, streaks and stains and the colors of all surfaces shall remain free from fading.
- C. Painting shall include all exposed surfaces of every member. Parts to be painted, inaccessible after installation, shall be painted before installation. Priming shall include all sides, edges and cut ends.
- D. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- E. Apply products in accordance with manufacturer's instructions.
- F. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- G. Apply each coat to uniform appearance.
- H. Sand wood and metal surfaces lightly between coats to achieve required finish.
- I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- J. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal, and as follows:
 - 1. All waste paint materials shall be separated and recycled. Collect waste paint by type and provide for delivery to recycling or collection facility.
 - 2. Materials that cannot be reused must be treated as hazardous waste and disposed of following rules and regulations of AHJ.
 - 3. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
 - 4. Eliminate contaminants entering waterways, sanitary/storm drain systems or into the ground from construction activities. Strictly adhere to the following procedures:
 - a. Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - b. Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

- c. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - d. Empty paint cans are to be dry prior to disposal or recycling (where available).
 - e. Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
5. Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.
- B. Upon completion of the paintwork, Contractor shall remove from the premises and dispose of all scaffolding, equipment and surplus material. Remove empty containers and other debris resulting from work of this section.
 - C. Contractor shall leave all glass areas, surfaces, floors and walls, hardware and any other surfaces clean from any paint, stain, splatterings, smears or smudges which are the result of his operations, taking care not to mar surfaces of items being cleaned. Contractor shall replace glass damaged by his operations.
 - D.
 - E. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION

SECTION 09 91 02

PAINTING SYSTEMS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Schedule of opaque paint systems for field application.
- B. Additional product requirements, execution, and surfaces not to be finished are specified in Section 09 90 00.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Base Manufacturer:
 - 1. Benjamin Moore Paints: www.benjaminmoore.com.
 - 2. Products of other manufacturers may be used under conditions specified in Section 09 90 00.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.02 EXTERIOR PAINT SYSTEMS

- A. Paint System "A" (Ferrous Metals) (Gloss):
 - 1. One (1) coat: IronClad Retardo Rust Inhibitive Paint 163 (MWF 2.9 mils min.)
 - 2. Two (2) coats: Impervo Enamel 133 (MWF 3.1 mils min. per coat)
- B. Paint System "B" (Galvanized Metal) (Gloss):
 - 1. One (1) coat: IronClad Galvanized Metal Latex Primer 163 at existing surfaces. Use 363 at new surfaces. (MWF 2.9 mils min.)
 - 2. Two (2) coats: Impervo Enamel 133 (MWF 3.1 mils min. per coat)

2.03 INTERIOR PAINT SYSTEMS

- A. General: Install Interior Paint according to the Drawings, approved submittals, manufacturer's instructions, and as follows:
- B. Hardware and Fixtures: Hardware, hardware accessories, plates, lighting fixtures and similar items in place not required to be painted shall be removed prior to painting and replaced on completion of each space. Heating and other equipment adjacent to wall shall be disconnected and moved to permit surfaces to be painted, using workmen skilled in appropriate trades. Following completion of painting, they shall be expertly replaced and reconnected.
- C. Exterior Doors: Finish inside of exterior hollow metal doors to match the exterior finish as specified under "Painting - Exterior".
- D. Exposed Plumbing, Mechanical and Electrical Items: Items such as conduits, pipes, ducts, grilles, registers, vents, access panels and items of similar nature shall be finished to match adjacent wall and ceiling surfaces, unless otherwise directed. Paint visible surfaces behind vents, registers, or grilles flat black. Wash exposed metal with solvent, and prime and paint spray paint wherever practicable. Do not paint concealed conduits, piping and ducts.
- E. Door lite frame and grilles shall be painted. Architect to make color selection.
- F. Degrease galvanized metal before painting, using mineral spirits or as approved by painting manufacturer.
- G. All exposed structural steel, metal deck and other exposed unfinished surfaces shall be painted except for exposed items in existing spaces, that will remain exposed unless noted otherwise.
- H. All plywood backboards required or indicated at electrical and or telecommunications rooms that are not scheduled as fire-retardant treated, shall receive a Class A fire retardant paint finish.

2.04 PAINT SCHEDULE - INTERIOR

- A. The following schedule applies to all surfaces not otherwise scheduled to receive finish by other trades. Reference

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MPI (PM) for Mxx numbers noted in parenthesis (xxx).

1. Paint System "1" (Gypsum Board and Plaster):
 - a. One (1) coat: Moorecraft Superspec Latex Enamel Undercoater & Primer Sealer (253)
 - b. Two (2) coats: Moorecraft Superspec Latex Eggshell Enamel (274)
2. Paint System "2" Not Used
3. Paint System "3" (Wood) (Semi-Gloss):
 - a. One (1) coat: Moorecraft Superspec Alkyd Enamel Undercoater Primer Sealer (245)
 - b. Two (2) coats: Moorecraft Superspec Latex Semigloss Enamel (276)
4. Paint System "4"
 - a. One (1) coat: PVC Trim:
 - b. One (1) coat: Tnemec Series 51-792 PVA Sealer
 - c. Two (2) coats: Tnemec Series 66 Epoxoline (satin sheen)

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following work:
 - 1. Barrier-free compliant room and door signs.
 - 2. Dimensional letter signs at building interior and exterior.
 - 3. Vinyl applique signs for interior and exterior doors as required by local authorities.
 - 4. Elevator call button signage.
 - 5. Miscellaneous signs required by building codes and/or local authority having jurisdiction.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. General Conditions, Supplementary Conditions, and applicable parts of Division 01 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 03 30 00 - Cast-in-Place Concrete - Substrate for warning tape.
 - 2. Section 04 20 00 - Unit Masonry: Substrate for signs.
 - 3. Section 06 20 00 - Finish Carpentry: Installing Signage provided by this Section.
 - 4. Section 07 90 05 - Joint Sealants; installation of adhesive sealant around wall mounted interior signs.
 - 5. Section 09 21 16 - Gypsum Board Systems: Substrate for signage.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. 521 CMR; The Massachusetts Architectural Access Board Rules.
- B. State Building Code, current edition and all referenced codes.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Shop Drawings: Submit shop drawing of sign appearance for each type of room and door sign, and commemorative plaque.
- E. Samples: Submit samples illustrating sign style, font, and method of attachment.

1. Room and Door Signs: Submit three samples representing actual sign materials and layout of graphics.
2. Dimensional Letters: Submit three samples of one letter, indicating finish, font, and method of attachment.
3. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

G. Qualification Statements: Manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.
- B. Mock-up Benchmark Installations the as follows:
 1. Provide Mock-ups for each different Signage type indicated by the Drawings, utilizing final specified materials and final production techniques. Install Mock-up in location acceptable to Architect for each type specified.
 - a. Notify Architect 7 days in advance of time when mock-up will be tested and available for review.
 - b. Modify and/or replace mock-up(s) as many times as necessary to obtain Architect's approval.
 - c. Do not start work of this section until each mock-up is reviewed and accepted by Owner and Architect.
 - d. Accepted mock-ups will be a Benchmark Installation used to indicate standard workmanship and pertinent details, and be used to comparatively judge the finished installation. Protect approved mock-up during construction period.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.07 WARRANTY

- A. Manufacturer Warranty: Prepare and submit in accordance with Section 01 78 00 - Closeout Submittals.
 1. Provide manufacturer's life of the installation warranty for dimensional letter signage.
 2. Provide manufacturer's standard warranty for all other signage, but not for less than the term specified in the conditions of the contract.

1.08 FIELD CONDITIONS

- A. Do not install tape or sealant adhesives when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 SIGN PRODUCTS

- A. Color and Font: Unless otherwise indicated:
 1. Character Font: to be selected from full range of options.
 2. Character Case: Upper case only.
 3. Background Color: to be selected from manufacturer's full range of available colors.
 4. Character Color: Contrasting color.

2.02 DIMENSIONAL LETTERS

A. Metal Letters:

1. Metal Letters:
 - a. Material: Cast, anodized aluminum.
 - b. Color: To be selected from manufacturer's full range of standard and non-standard available colors.
2. Font: To be selected from manufacturer's full range of standard and non-standard fonts.
 - a. Letter height: As indicated on Drawings.
3. Mounting: Projected mounting with threaded stud bosses. Anchor to building using methods suitable to substrate.

2.03 VINYL APPLIQUE SIGNS

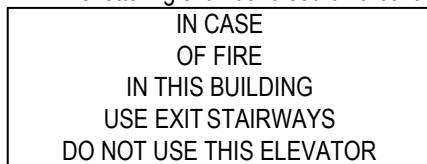
A. High performance vinyl graphics with self-adhesive backing.

1. Font shall be Arial or Helvetica, or as indicated in Drawings.
2. Vinyl graphics at exterior doors:
 - a. One (1) 4 inch high number shall be applied to each inside and outside face of all exterior doors. Exception: At double doors or a bank of doors, apply to one leaf (both sides).
 - b. Exact location on door shall be coordinated with Owner and Architect prior to installation.
 - c. Numbering system shall be coordinated with Owner and Fire Protection Contractor for their use in keying numbers to fire alarm control panel.

2.04 ELEVATOR CALL BUTTON SIGNAGE

A. Provide wall mounted advisory signage at every elevator hall button station.

1. Minimum size shall be 3¼" x 2¼".
2. The lettering shall be raised on a contrasting background, and shall read and be sized as follows:



3. "In Case of" 1/8 inch text height or 14 point lettering Color: Black.
4. "Fire" shall be 3/8 inch text height or 30 point lettering Color: Red.
5. "In This Building" shall be 1/8 inch or 14 point lettering Color: Black.
6. "Use Exit Stairways" shall be 3/16 inch text height or 16 point lettering Color: Red.
7. "Do Not Use This Elevator" shall be 1/8 inch text height or 14 point lettering Color: Black.

2.05 ACCESSORIES

- A. Fasteners, Anchors, Brackets, and Tape: Type and material recommended by manufacturer for use intended and appropriate for substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
- B. Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - 1. Verify that field measurements, substrates, structural support, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install Signage according to the Drawings, approved submittals, manufacturer's instructions, and as follows:
- B. Install neatly, with horizontal edges level.
- C. Locate signs at each office and entry.
 - 1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches above finished floor in accordance with Massachusetts Architectural Access Board and ADAAG requirements.
 - a. Where there is no wall space to the latch side of the door, including at double leaf doors, signs shall be mounted on the nearest adjacent wall. Where sidelights exist at latch side of door, install signage to the glass using adhesives tapes or sealants as recommended by manufacturer, and provide and install blank plates of same size, material, and background color as the signs at the opposite side of the glass in alignment with the sign.
 - 2. Securely mount with heavy-duty double stick adhesive tape. At exterior signage apply pick-proof adhesive sealant to full perimeter of each sign tooled to assure that sealant is flush with edge of sign.
- D. Metal Letters shall be mounted with studs set in drilled holes in substrate with mfr's recommended adhesive cement. Follow manufacturer's installation instructions. See interior elevations for locations and mounting heights.

3.03 FIELD QUALITY CONTROL

- A. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items prior to inspection for Substantial Completion.
 - 1. Finish touch-up damaged surface finishes.
 - 2. Replace damaged materials and components with New if repair not acceptable to Architect.

3.04 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

3.05 PROTECTION

- A. Protect installed work from subsequent construction operations until date of Substantial Completion or Owner Occupancy, whichever occurs first.

END OF SECTION

SECTION 10 26 01

WALL AND CORNER GUARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, and delivering the following Work, for installation by Section 06 20 00 - Finish Carpentry:
 - 1. Corner guard assemblies: metal with plastic covers.
 - 2. Accessories needed for a complete installation, including fasteners and anchors.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work being performed by others, but related to this Section, and with which this contractor must coordinate with and/or accommodate the Work of, or which contain requirements that affect the Work of this Section include the following:
 - 1. Section 06 10 00 - Rough Carpentry: Blocking for wall and corner guard anchors.
 - 2. Section 06 20 00 - Finish Carpentry: Installation of corner guards.
 - 3. Section 09 21 16 - Gypsum Board Assemblies: Wall construction.
 - 4. Section 09 65 00 - Resilient Flooring: Base.
 - 5. Section 09 90 00 - Painting and Coating.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ANSI. American National Standards Institute; www.ansi.org.
 - a. ICC A117.1 - Accessible and Usable Buildings and Facilities; International Code Council (ANSI).
 - 2. ASTM. ASTM International; www.astm.org.
 - a. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - b. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.04 SUBMITTALS

- A. Construction Submittals
 - 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - a. Product Data: Indicate physical dimensions, features, anchorage details, rough-in measurements, and required blocking.
 - b. Samples:
 - 1) Color Samples for initial selection: 1 full range of standard and non-standard colors.
 - 2) Samples: Submit three sections of each type of corner guard, 12 inch long, illustrating component design, configuration, and selected color and finish.
- B. Closeout Submittals
 - 1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements, and Section 01 78 00 - Closeout Submittals.
 - a. Copy of manufacturer's warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company with a minimum of five years experience specializing in manufacturing Products specified in this Section.
- B. Single Source Responsibility: Furnish system materials and components from one manufacturer for entire Project.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, and Section 01 60 00.
 - 1. Store materials in original, undamaged packaging in a cool, dry place out of direct sunlight and exposure to the elements. A minimum room temperature of 40 deg F (4 deg C) and a maximum of 100 deg F (38 deg C) should be maintained.
 - 2. Material shall be stored flat.

1.07 PROJECT CONDITIONS

- A. Materials must be acclimated in an environment of 65 to 75 deg F (18 deg C to 24 deg C) for at least 24 hours prior to beginning the installation.
- B. Installation areas must be enclosed and weatherproofed before installation commences.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Construction Specialties, Inc: www.c-sgroup.com.
 - 2. InPro Corporation: www.inprocorp.com.
 - 3. Alpar Architectural Products, LLC: www.alpararch.com
 - 4. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: See Section 01 60 00, Product Requirements.

2.02 COMPONENTS

- A. Corner Guard Type CG-1:
 - 1. Basis of Design: Construction Specialties; Acrovyn SM-20N and SSM-20N
 - a. Material: Metal with plastic cover.
 - b. Width of wings: 3" at single corners, 2" at back to back "wing wall" conditions as needed to fit wall thickness.
 - c. Color: Selected from full list of standard colors.
 - d. Length: One piece, 4'-0" standard length unless otherwise noted on drawings. Provide matching color cap trim.
 - 2. Styles:
 - a. Provide 90 degree corners and angled configurations to fit wall conditions as depicted in drawings.
 - b. At wing wall conditions where thickness of partition and finish does not fit three inch wide corner guards at each corner, provide two inch wide corner guards at each corner.
- B. Attachment Hardware: Appropriate to component and substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements.
 - 1. Carefully examine installation areas with Installer present, for compliance with requirements affecting Work performance. Verify that field measurements, rough openings, substrates, structural concealed blocking support, anchors, tolerances, levelness, plumbness, humidity, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install Corner Guard System according to approved submittals, manufacturer's instructions, ADA and state and local barrier free requirements, and as follows:
- B. Install corner guards at locations shown in drawings, and at each "outside" corner of gypsum board walls and partitions in corridors, circulation spaces, and utility spaces including, but not limited to:
 1. Storage Rooms.
 2. Corridors, lobbies, and circulation spaces.
- C. Install vertical corner guards with bottom edge of guard installed at top edge of wall base material.
- D. Install components level and plumb, secured rigidly in position, using only approved mounting hardware, to wall framing members only.
- E. Adjust installed end caps as necessary to ensure tight seams.
- F. Provide lengths and configurations to fit conditions shown, including guards to fit corner angles at other than 90 degrees.

3.03 FIELD QUALITY CONTROL

- A. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items prior to inspection for Substantial Completion.
 1. Finish touch-up damaged surface finishes.
 2. Replace damaged materials and components with New if repair not acceptable to Architect.

3.04 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 1. Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.
- B. General: Immediately upon completion of installation, clean guards and accessories in accordance with manufacturer's recommended cleaning method.

3.05 PROTECTION

- A. Protect installed work from construction operations until date of Substantial Completion or Owner occupancy, whichever occurs first. Use materials that may be easily removed without leaving residue or permanent stains.

END OF SECTION

SECTION 10 28 00

WASHROOM ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, and delivering Washroom Accessories for installation by Section 06 20 00 Finish Carpentry and the following
 - 1. Accessories for toilet rooms, showers, utility rooms, and Janitor's Closets, excluding detention areas, except as noted.
 - a. Toilet Paper Dispensers - to be supplied by Owner, installed by General Contractor.
 - b. Paper Towel Dispensers - to be supplied by Owner, installed by General Contractor.
 - c. Combination Towel Dispenser / Waste Receptacles - to be supplied by Owner, installed by General Contractor.
 - d. Waste Receptacles - to be supplied by Owner, installed by General Contractor.
 - e. Soap Dispensers - to be supplied by Owner, installed by General Contractor.
 - f. Mirrors.
 - g. Grab bars.
 - h. Sanitary Napkin Disposal Units
 - i. Diaper Stations
 - j. Combination Utility Shelf / Mop and Broom Holders.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work related to this Section, and with which this contractor must coordinate with and/or accommodate the Work of, or which contain requirements that affect the Work of this Section include the following:
 - 1. Section 01 31 14 - Coordination.
 - 2. Section 05 50 00 - Metal Fabrications: Concealed supports for accessories.
 - 3. Section 06 1000 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates.
 - 4. Section 06 20 00 - Finish Carpentry: Installation of Accessories.
 - 5. Section 09 21 16 - Gypsum Board Assemblies: Partitions to receive recessed and surface mounted accessories.
 - 6. Section 09 30 00 - Tiling: Wall finishes to receive accessories.
 - 7. Section 26 10 00 - Electrical: Provision of power to accessories with electrical operation

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. ASTM. ASTM International; www.astm.org
 - a. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - b. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

- c. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 - d. ASTM C1036 - Standard Specification for Flat Glass.
 - e. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
 - f. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.
 - g. ASTM C 1503 - Standard Specification for Silvered Flat Glass Mirror
2. UL. Underwriters Laboratories Inc.; www.ul.org.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the placement of internal wall reinforcement, rough wall openings, blocking, and reinforcement of toilet partitions, with the work of this section, and per Section 01 31 14 to receive anchor attachments.

1.05 SUBMITTALS

A. Construction Submittals

- 1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
 - a. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
 - b. Certifications: Lead-free; hexavalent chromium-free finishes.

B. Closeout Submittals

- 1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements, and Section 01 78 00 - Closeout Submittals.
 - a. Warranty Documentation: Executed warranties.
 - b. Operation and Maintenance Data: Cleaning and maintenance recommendations.

1.06 QUALITY ASSURANCE

A. Regulatory Agency Approvals:

- 1. Washroom Accessories: Comply with ADA and MAAB (521 CMR) requirements.

B. Manufacturer Qualifications: Company with a minimum of five (5) years experience specializing in manufacturing products specified in this Section.

C. Single source responsibility: Furnish Washroom Accessories items of each type from one manufacturer for entire Project, unless otherwise acceptable to Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instructions and recommendations, Section 01 60 00, and as follows:

- 1. Store in dry location. Maintain protective covers on all units until installation is complete. Remove covers at final clean up of installation.

1.08 WARRANTY

A. Manufacturer Warranty:

- 1. Hand Dryers: Five years.
- 2. Mirrors: 10 year limited warranty against silver spoilage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Toilet Accessories:

- 1. Basis of Design Manufacturer: Bobrick Washroom Equipment, Inc., www.bobrick.com.
- 2. A & J Washroom Accessories Inc: www.ajwashroom.com.
- 3. American Specialties, Inc: www.americanspecialties.com.

4. Bradley Corporation: www.bradleycorp.com.
5. Other manufacturer's products accepted by the Awarding Authority as equal to the specified products in terms of construction, quality, durability, performance, and or appearance. Submit as substitutions: see Section 01 60 00.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 1. Grind welded joints smooth.
 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Stainless Steel Tubing: ASTM A269, Type 304 or 316.
- D. Mirror Glass: Float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.
- F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.
- C. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 TOILET ROOM ACCESSORIES

- A. Mirrors, Framed (MIR): Stainless steel framed, 6 mm thick float glass mirror.
 1. Size: 18 inch wide X 36 inch high.
 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
 4. All exposed surfaces shall have polished finish.
 5. Plate glass mirror shall be guaranteed 10 years against silver spoilage.
 6. Back is galvanized steel secured to concealed wall hanger with theft-resistant locking device.
 7. Product: B-165 Series manufactured by Bobrick.
- B. Grab Bars (GB): Type 304, stainless steel, 1-1/2 inches outside diameter (unless it is PK-GB which is a 1 inch outside diameter), minimum 0.05 inch (18 gage) wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar, unless noted otherwise; accessible.
 1. Length and Configuration: As indicated on drawings
 2. GB Product: B-6806 Series by Bobrick

2.05 JANITOR'S CLOSET ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder (MH): 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 1. Hooks: 2, 0.06 inch stainless steel rag hooks at shelf front.
 2. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.
 3. Length: Manufacturer's standard length for number of holders/hooks.
- B. Provide one at each janitor's closet mop receptor.

PART 3 EXECUTION

- 3.01 **EXAMINATION**
- A. Verify existing conditions before starting work.
 - B. Coordinate locations and rough openings dimensions for recessed accessories as walls are being framed. Notify Architect promptly of any conflicts with other recessed equipment, and structural framing.
 - C. Coordinate in-wall utility locations with accessories and relocate if needed at no cost to Owner.
 - D. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements.
 - E. Carefully examine installation areas with Installer present for compliance with requirements affecting the Work.
 - 1. Verify that field measurements, clearances, substrates, structural blocking, reinforcing plates, and concealed anchors in walls and ceilings, utility connections, tolerances, levelness, plumbness, cleanliness and other conditions are within tolerance requirements of the manufacturer and ready to receive Work.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.02 **PREPARATION**
- A. Deliver inserts and rough-in frames to site for timely installation.
 - B. Provide templates and rough-in measurements to General Contractor for coordination with other subcontractors.
- 3.03 **INSTALLATION**
- A. Install accessories in accordance with manufacturers' instructions in locations indicated on the drawings.
 - B. Provide shower curtains for each shower in project, including detention areas.
 - C. Install plumb and level, securely and rigidly anchored to substrate.
 - D. Mounting Heights and Locations: the most restrictive applicable accessibility regulations, as indicated on drawings.
- 3.04 **FIELD QUALITY CONTROL**
- A. See Section 01 40 00 - Quality Requirements for additional requirements.
 - B. Non-conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items.
 - 1. Finish touch-up damaged surface finishes.
 - 2. Replace damaged materials and components with New if repair not acceptable to Architect.
- 3.05 **ADJUSTING**
- A. Test accessories and adjust for proper operation.
- 3.06 **CLEANING**
- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 - B. Clean exposed surfaces.
- 3.07 **PROTECTION**
- A. Protect installed work from construction operations until date of Final Completion or Owner occupancy, whichever occurs first.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, and delivering, the following work, for installation by Section 06 20 00 - Finish Carpentry:
 - 1. Fire extinguishers.
 - 2. Fire extinguisher cabinets.
 - 3. Accessories required for a complete installation, including but not limited to brackets, fasteners and anchors.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work being performed by others, but related to this Section, and with which this contractor must coordinate with and/or accommodate the Work of, or which contain requirements that affect the Work of this Section include the following:
 - 1. Section 04 20 00 - Unit Masonry: Coordinate rough opening sizes in masonry walls for recessed cabinets.
 - 2. Section 06 10 00 - Rough Carpentry : Wood and/or sheet metal blocking to secure wall-mounted extinguishers and accessories.
 - 3. Section 06 20 00 - Finished Carpentry: Installation of cabinets and extinguishers.
 - 4. Section 09 21 16 - Gypsum Board Assemblies: Coordinate rough openings in metal stud construction for recessed cabinets.
 - 5. Section 09 90 00 - Painting and Coating.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. MSBC (780 CMR). Massachusetts State Building Code, 9th Edition.
 - 2. ADAAG (28 CFR Part 32) - Americans with Disabilities Act Accessibility Guidelines.
 - 3. MAAB (521 CMR 1.00); The Massachusetts Architectural Access Board Rules.
 - 4. NFPA 10 - Standard for Portable Fire Extinguishers.

1.04 SUBMITTALS

- A. Construction Submittals:
 - 1. Submit in accordance with Section 01 30 00 - Administrative Requirements.
 - a. Shop Drawings: Indicate cabinet physical dimensions and rough-in measurements for recessed cabinets.
 - b. Product Data: Provide extinguisher operational features, color and finish, anchorage details, and cabinet design.
 - c. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
 - d. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- B. Closeout Submittals:
 - 1. Submit in accordance with Section 01 70 00 - Execution and Closeout Requirements, and Section 01 78 00 - Closeout Submittals.

- a. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

1.06 QUALITY ASSURANCE

- A. Regulatory Agency Approvals: Conform to NFPA 10 requirements for portable fire extinguishers.
- B. Manufacturer Qualifications: Company with a minimum of ten (10) years experience specializing in manufacturing Products specified in this Section.
- C. Single Source Responsibility: Furnish system materials from one manufacturer for entire Project, unless otherwise acceptable to Architect.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers, Cabinets and Accessories:
 - 1. Basis of Design Manufacturer: Larsen's Manufacturing Co.; www.larsensmfg.com.
 - 2. Subject to compliance with requirements of these specifications, equivalent products from the following manufacturers:
 - a. JL Industries, Inc: www.jlindustries.com.
 - b. Potter-Roemer: www.potterroemer.com.
 - 3. Substitutions: Not permitted.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
 - 1. Class: 4A:80B:C.
 - 2. Size: 10 pound.
 - 3. Finish: Baked polyester powder coat, red color.
 - 4. Basis of Design model: MP-10.
- C. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
 - 1. Class: 2A:K.
 - 2. Size: 6 Liters.
 - 3. Finish: Polished stainless steel.
 - 4. Basis of Design model: WC-6L.

2.03 FIRE EXTINGUISHER CABINETS

- A. Metal: Formed primed steel sheet; 0.036 inch thick base metal.
- B. Cabinet Configuration: Semi-recessed type.
 - 1. Basis of Design model: Architectural Series, Vertical Duo Style.
 - 2. Sized to accommodate extinguisher and accessories.
 - 3. Trim: Returned to wall surface with rounded corners, with 2-1/2 inch projection, 1-3/4 inch wide face.
- C. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge. Provide roller type catch.
 - 1. Door Glazing: Glass, clear, 1/8 inch thick tempered. Set in resilient channel gasket glazing.
- D. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
- E. Weld, fill, and grind components smooth.

- F. Cabinet Finish:
 - 1. Exterior Trim and Door: No. 4.
 - 2. Cabinet Interior: White enamel.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.
- B. Graphic Identification: Provide the following:
 - 1. If so directed by the authority Having Jurisdiction, provide manufacturer's standard engraved or silk-screened projecting signage for surface mount application to walls above recessed cabinets.
 - a. Provide red graphics and text on white background.
 - b. Basis of Design: PTD-108.
 - 2. Type K Extinguisher Placard:
 - a. Signage meeting the requirements of NFPA-10, Appendix A.
 - b. White text and graphics on red background.
 - c. Text to read:

WARNING
**IN CASE OF APPLIANCE FIRE, USE THIS EXTINGUISHER AFTER HOOD SUPPRESSION SYSTEM
HAS BEEN ACTIVATED**
 - d. Include pictogram of fire extinguisher.
 - e. Sign shall measure approximately 8 inches high x 11 inches wide.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
 - 1. Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, rough openings, substrates, structural support and blocking, tolerances, levelness, plumbness, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - b. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Verify existing conditions before starting work.
- C. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. The items of this Section shall be installed by Section 06 20 00 FINISH CARPENTRY in strict accordance with the Drawings, approved submittals, state building code, and NFPA 10 requirements, and as follows:
 - 1. Install in accordance with manufacturer's instructions.
 - 2. Install cabinets plumb and level in wall openings, 48 inches from finished floor to top inside of cabinet.
 - 3. Secure rigidly in place.
 - 4. Place extinguishers in cabinets and on wall brackets.
 - a. Do not place extinguishers when risk of freezing temperatures exist.
 - 5. Provide completed inspection / service tags on all extinguishers.
- B. Provide fire extinguishers and cabinets as indicated in drawings and described herein:
 - 1. Type FE: Dry Chemical Fire Extinguisher mounted on surface mount wall bracket.
 - 2. Type FE&C: Dry Chemical Fire Extinguisher in Cabinet; provide fire rated cabinets in fire rated walls.

- C. Provide (1) dry chemical fire extinguisher (FE) on bracket in each Elevator Machine Room, whether or not indicated on plans.
- D. Provide graphic identification at each semi-recessed fire extinguisher cabinet and type FE-K extinguisher..
 - 1. Locate signs for fire extinguisher cabinets at 80 inches above floor to center of sign.

3.03 CLEANING AND PROTECTION

- A. Comply with requirements of 01 74 19 - Construction Waste Management and Disposal.
- B. Protect installed work from damage during construction operations until Date of Substantial Completion or Owner Occupancy, whichever comes first.

END OF SECTION

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, and installing the following Entrance Floor Grid and Frame work:
 - 1. Floor Grilles & Frame Assemblies.
 - 2. Accessories as needed for a complete installation.
 - 3. Carpet mats.

1.02 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Contractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions and applicable parts of Division 01 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 - 1. Section 08 43 13 - Aluminum-Framed Storefronts: door saddles and threshold conditions.
 - 2. Section 08 43 13 - Glazed Aluminum Curtain Walls: door saddles and threshold conditions.
 - 3. Section 08 71 00 - Finish Hardware: Door saddles and threshold conditions.
 - 4. Section 09 30 00 - Tiling: tile flooring surrounding inset walk-off mats, setting bed base below floor mats.

1.03 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 - 1. AAMA. American Architectural Manufacturers Association; www.aamanet.org.
 - 2. ASTM. ASTM International; www.astm.org.
 - a. B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - b. D 2047 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
 - c. E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination per Section 01 31 14 and the following:
 - 1. Coordinate with Section 03 30 00 for embedded anchor items, frame assembly templates, and grouting in frames
 - 2. Coordinate with Section 09 30 00 for tile work abutting frame assemblies and grouting between frames and tile.

1.05 SUBMITTALS

- A. Construction Submittals:
 - 1. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - 2. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.
 - 3. Shop Drawings: Indicate dimensions and details for recessed frame.
 - a. For recessed frames located within a dimensionally restricted area, show dimensions of space within which the frame will be installed.

- b. Items penetrating floor grids and frames including, but not limited to, door control devices.
- c. Divisions between grid sections.
- d. Perimeter floor molding.
- 4. Initial Selection Samples: Submit samples showing complete range of standard, non-standard, and custom colors, textures, and finishes available for each material used.
- 5. Verification Samples: Submit three (3) samples, 12 x 12 inch in size illustrating pattern, color, finish, edging.
- B. Closeout Submittals:
 - 1. Submittal Procedures: Section 01 78 00.
 - a. Warranty Documentation: Executed warranties.
 - b. Maintenance Data: Include cleaning instructions, stain removal procedures.

1.06 QUALITY ASSURANCE

- A. Regulatory Agency Approvals: Provide products complying with the following:
 - 1. Massachusetts Building Code 780CMR, 9th Edition.
 - 2. 521CMR Architectural Access Board of the Commonwealth of Massachusetts.
 - 3. ADA Standards for Accessible Design, 2010.
 - 4. Flammability in accordance with ASTM E 648, Class 1, Critical Radiant Flux, minimum 0.45 watts/m².
 - 5. Slip resistance in accordance with ASTM D 2047, Coefficient of Friction, minimum 0.60 for accessible routes.
- B. Single Source Responsibility: Furnish Entrance Floor Grid and Frame system materials from one manufacturer for each type for entire Project, unless otherwise acceptable to Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions and recommendations, Section 01 60 00, and as follows:
 - 1. Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

1.08 FIELD CONDITIONS

- A. Field Measurements: Check actual openings for grids/grids by accurate field measurements before fabrication. Record actual measurements on final shop drawings.
 - 1. Coordinate fabrication schedule with construction progress to avoid delay of work.
- B. Recess Application: Coordinate frame installation with concrete and/or tile setting bed construction to ensure recess and frame anchorage are accurate and that the base is level and flat. Defer frame installation until building enclosure is complete and related interior finish work is complete.

1.09 WARRANTY

- A. Manufacturer / Special Warranty: Prepare and submit in accordance with Section 01 78 00 - Closeout Submittals.
 - 1. Product: Provide manufacturer's written three year material warranty on grids.
 - 2. Warranty period shall begin on date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Entrance Floor Grilles and Frame:
 - 1. Basis-of-Design Product / Manufacturer: G4 PediTred by Construction Specialties Inc. (www.c-sgroup.com/entrance-flooring/products), or an Architect acceptable equivalent product subject to compliance with requirements from one of the following manufacturers:
 - a. Pawling Corporation; EM-650-MLW: www.pawling.com.
 - b. Reese Enterprises, Inc; PerfectMat aluminum hinge: www.reeseusa.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ENTRANCE FLOOR GRILLES AND FRAMES

- A. Entrance Floor Grilles: Recessed extruded aluminum hinged grille assembly with nominal 1 inch wide tread strips running perpendicular to traffic flow, slots between treads, and perimeter frame forming sides of recess; grille hinged for access to recess.
1. Recess Depth: 3/8 inches.
 2. Tread Surfaces: Polypropylene brush.
 3. Colors: As shown on drawings, or if not indicated, to be selected by Architect from manufacturer's full range of standard and non-standard colors.
 4. Length in Direction of Traffic Flow: as indicated on Drawings.
 5. Width Perpendicular to Traffic Flow: as indicated on Drawings.
 6. Frame: Mill aluminum installation on surface of concrete using mechanical fasteners, against adjacent finishes with minimal exposed trim.
 - a. ASTM B221 Aluminum alloy 6063-T5/T6 or ASTM B308 Aluminum alloy 6061-T6.
 - b. Coat surfaces in contact with concrete with manufacturer's standard protective primer coat.
 7. Mounting: Top of mat walking surface level with adjacent floor finish.
 8. Structural Capacity: Capable of supporting a rolling load of 500 pounds without permanent deformation or noticeable deflection.
 9. Vibration Resistant Fabrication: All members welded, riveted, or bolted; no snap or friction connections.
 10. Include all accessories to complete a surface mounted installation.
- B. Tiling Subcontractor shall install setting bed throughout space and tile border. Entrance Floor Mats and Frames sub-contractor shall provide self-leveling compound to adjust depth and levelness of recesses if needed.

2.03 FABRICATION

- A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.
- B. Provide frame pieces in longest available lengths to minimize joints. Space unavoidable joints evenly about centerline of grid and spline butt-joints with connecting pins. Form corners with tightly mitered joints or use prefabricated jointless corners.
- C. Provide frames and grids to sizes, shapes, and profiles indicated on shop drawings. Provide one-piece grids except where size exceeds manufacturer's recommended limit for easy removal and cleaning. Where more than one-piece grids are used, locate seams away from main traffic pattern.
- D. Coat surfaces with protective coating where in contact with cementitious materials.
- E. Fabricate mats in single unit sizes; fabricate multiple mats where indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
 - 1. Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 - a. Verify that field measurements, substrates, floor openings and recesses, embedded structural supports, tolerances, levelness, plumbness, moisture content level, cleanliness and other conditions are within acceptable tolerance requirements of the manufacturer, and ready to receive Work.
 - b. Proceed with installation only after unsatisfactory conditions have been corrected.
 - c. Verify that floor opening for mats are ready to receive work.

3.02 PREPARATION

- A. Surface Preparation: Refer to manufacturer's instructions and recommendations for preparation of substrates.
 - 1. Vacuum clean floor recess.
 - 2. Apply heavy coating of bituminous paint to metal of recessed frames, if unprotected, which will be in contact with concrete.
- B. Grids: Verify size and depth of floor recess before fabricating mats.
- C. Apply self-leveling compound to assure depth of recess meets manufacturer's installation requirements.

3.03 INSTALLATION

- A. General: Install Entrance Floor Grids and Frames according to the Drawings, submittals, manufacturer's instructions, and as follows:
 - 1. Install frames to achieve flush plane with finished floor surface.
 - 2. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.
 - 3. Shim and grout frame into oversize recess.
 - 4. Interface with Other Work:
 - a. Coordinate with Section 09 30 00 - Tiling for frame assembly templates, and depth of recess.
 - b. Coordinate top of grid elevation with frame and floor elevations to provide proper foot cleaning, and to avoid all possibility of tripping hazards.
 - c. Coordinate top of insert and grid surfaces with bottom of doors that swing across to provide ample clearance between door and grid/grid.

3.04 TOLERANCES

- A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Non-Conforming Work per General and Supplementary Conditions, and as follows: Remove, Repair and Reinstall or Restore in Place damaged items prior to inspection for Substantial Completion.
 - 1. Replace damaged materials and components with New if repair not acceptable to Architect.

3.06 CLEANING

- A. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

3.07 PROTECTION

- A. Protect installed work from subsequent construction operations until date of Substantial Completion or Owner Occupancy, whichever occurs first.
- B. After completing required frame installation and self-leveling compound, provide temporary filler of plywood or fiberboard in recess, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.
- C. Defer installation of floor grids/grids until just prior to Substantial Completion.

SECTION 14 00 01

ELEVATORS FILED SUB-BID SUMMARY

PART 1 GENERAL

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A - 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid deposit specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this Filed Sub-Bid section shall include all furnishing and installation of complete Elevator systems for the project as shown in the drawings, as described in the Specifications, or as reasonably inferred from either, in the opinion of the Architect.
- B. The Work of this Filed Sub-Bid Section may be (but is not necessarily always) indicated in the drawings with the note "by elevator contractor".
- C. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - 1. Section 14 20 10: PASSENGER ELEVATORS.
- D. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.

- E. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Waste Removal/Dumpster: This Filed Sub-Bid Subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- G. Cutting and Patching: The Work of this Filed Sub-Bid Section shall include all Cutting and Patching required to complete the work of the above listed Sections.
- H. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements of the following Sections:
 - 1. Section 03 30 00: CAST-IN-PLACE CONCRETE; pit construction and sump location.
 - 2. Section 04 20 00: UNIT MASONRY; door frames and rail anchors to be incorporated into masonry walls.
 - 3. Section 05 12 00: STRUCTURAL STEEL FRAMING; hoisting / safety beam.
 - 4. Section 05 50 00: METAL FABRICATIONS; Pit ladder, sump cover.
 - 5. Section 07 13 00: SHEET WATERPROOFING.
 - 6. Section 07 84 00: FIRESTOPPING.
 - 7. Section 07 90 05: JOINT SEALERS.
 - 8. Section 09 65 00: RESILIENT FLOORING.
 - 9. Section 10 44 00: FIRE PROTECTION SPECIALTIES.
 - 10. Division 21 - FIRE PROTECTION sections.
 - 11. Division 22: PLUMBING sections.
 - 12. Division 23: HVAC Sections.
 - 13. Division 26: ELECTRICAL Sections.
- I. Primary Drawings listed are those intended to indicate the Scope of Work for this trade. T-1.1,A-1.1, A-1.2, A-1.3, A-3.4, A-3.7, A-3.8, S-1.1, S-1.2, S-1.3, S-3.2, M-1.1, M-1.2, M-1.3, M-1.4, P-1.1, P-1.2 E-1.1, E-1.2, E-1.4, FA-1.0, FA-1.1, FA-1.2, P-1.1, P-1.2. In addition to the above listed "Primary Drawings" that define the scope of this section, this subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- D. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- E. Section 01 50 00 - Temporary Facilities and Controls.
- F. Section 01 57 21 - Indoor Air Quality Controls: Procedures and testing.
- G. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- H. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures;

preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.

- I. See Section 01 74 19 - Construction Waste Management and Disposal.
- J. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.
- K. Section 01 79 00 - Demonstration and Training: Detailed requirements.

1.05 REFERENCE STANDARDS

- A. Refer to individual specification sections listed as part of the Work of this Filed Sub-Bid Section for Reference Standards.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to individual specification sections listed as part of the Work of this Filed Sub-Bid Section for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Massachusetts.
- B. Refer to individual specification sections listed above for additional requirements.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Refer to individual specification sections listed above for specific warranty requirements.
 - (1) PART 2 PRODUCTS (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR PRODUCT REQUIREMENTS.
 - (2) PART 3 EXECUTION (REFER TO INDIVIDUAL SPECIFICATION SECTIONS LISTED ABOVE FOR EXECUTION REQUIREMENTS.

3.01 CLEANING

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 14 20 10

PASSENGER ELEVATORS

PART 1 GENERAL

1.01 FILED SUB-BID REQUIRED

- A. The work of this Section shall be included in the Elevators Filed Sub-Bid. Refer to Section 14 00 01: Elevators Filed Sub-Bid Summary for additional requirements.

1.02 SECTION INCLUDES

- A. Fabricating, furnishing, delivering, erecting and installing the following work:
 1. Complete passenger elevator systems.
 2. Elevator maintenance.
 3. Accessories needed for a complete installation.

1.03 RELATED REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Work described in other Sections which contain requirements applicable to the work of this Section, or with which this contractor must coordinate the work of this section include the following:
 1. Section 03 30 00 - Cast-in-Place Concrete: coordination of elevator pit dimensions and location of sump..
 2. Section 04 20 00 - Unit Masonry: Coordination of dimensions of masonry hoistway enclosure; building-in of elevator rail supports, building-in and grouting hoistway door frames.
 3. Section 05 12 00 - Structural Steel Framing: overhead hoist beams.
 4. Section 05 50 00 - Metal Fabrications: Pit ladder.
 5. Section 07 13 00 - Sheet Waterproofing: Waterproofing of exterior of elevator pit walls and floor.
 6. Section 09 65 00 - Resilient Flooring: Floor finish in cab.
 7. Section 10 44 00 - Fire Protection Specialties: Fire extinguisher in elevator machine room.
 8. Division 21 Fire Protection sections: fire protection in hoistway and machine room.
 9. Division 23 HVAC: mechanical venting of hoistway and machine room.
 10. Division 26 Electrical: electrical service to elevator equipment.

1.04 PRICE PAYMENT PROCEDURES

- A. Refer to section 01 20 00 - Price and Payment Procedures.

1.05 DEFINITIONS

- 1.06 Defective Elevator Work: Repeated operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions

1.07 REFERENCE STANDARDS

- A. Editions of listed Standards as referenced by applicable codes; if no edition is referenced, the current edition of the following:
 1. ADA - Americans with Disabilities Act Accessibility Guidelines. 2010 edition.
 2. MAAB (521 CMR); The Massachusetts Architectural Access Board Rules. Current edition.
 3. AISC 360 - Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc..
 4. ASME A17.1 - Safety Code for Elevators and Escalators; The American Society of Mechanical Engineers.

5. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
6. NFPA 70 - National Electrical Code; National fire Protection Association.
7. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
8. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc..
9. UL (ECMD) - Electrical Construction Materials Directory; Underwriters Laboratories Inc..

1.08 ADMINISTRATIVE REQUIREMENTS

- A. Coordination per Section 01 31 14, and as follows:
 1. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.
 2. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders, sumps, entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.
 3. Coordinate required pit depth and dimensions with the General Contractor and concrete subcontractor.
 4. Obtain elevator permit and inspection, paying for all associated costs.
- B. Preinstallation Meeting per section 01 70 00: Convene a meeting one week prior to starting work.
 1. Review schedule of installation, installation procedures and conditions, and coordination with related work.
- C. Construction Use of Elevator: Not permitted.

1.09 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate the following information:
 1. Locations of machine room equipment: driving machines, controllers, governors and other component.
 2. Hoistway components: Car, counterweight, sheaves, machine and sheave beams, guide rails, buffers, ropes, and other components.
 3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 4. Individual weight of principal components; load reaction at points of support.
 5. Loads on hoisting beams and location of trolley beams.
 6. Clearances and over-travel of car and counterweight.
 7. Locations in hoistway and machine room of traveling cables and connections for car light.
 8. Location and sizes of access doors, doors, and frames.
 9. Expected heat dissipation of elevator equipment in machine room.
 10. Applicable seismic design data; certified by a licensed Professional Structural Engineer.
 11. Interface with building security system.
 12. Electrical characteristics and connection requirements.
 13. Show arrangement of equipment in machine room so rotating elements, sheaves, and other equipment can be removed for repairs or replaced without disturbing other components. Arrange equipment for clear passage through access door.
- C. Product Data: Provide data on the following items:
 1. Signal and operating fixtures, operating panels, indicators.
 2. Cab design, dimensions, layout, and components.
 3. Cab and hoistway door and frame details.
 4. Electrical characteristics and connection requirements.

- D. Samples: Submit two samples, 12 x 12 inch in size illustrating cab interior finishes.
- E. Maintenance Contract: sample maintenance contract.
- F. Maintenance Data: Include:
 - 1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
 - 2. Technical information for servicing operating equipment.
 - 3. Legible schematic of hydraulic piping and wiring diagrams of installed electrical equipment and changes made in the Work. List symbols corresponding to identity or markings on machine room and hoistway apparatus.
- G. Qualification Statements: Manufacturer and installer.

1.10 CLOSEOUT SUBMITTALS:

- A. Submittal Procedures: Section 01 78 00.
 - 1. Warranty Documentation: Executed 1 year warranty.
 - 2. Executed Maintenance Contract.
 - 3. Operation and Maintenance Data: Operating, cleaning and maintenance recommendations, and the following:
 - a. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
 - b. Technical information for servicing operating equipment.
 - c. Legible schematic of hydraulic piping and wiring diagrams of installed electrical equipment and changes made in the Work. List symbols corresponding to identity or markings on machine room and hoistway apparatus.

1.10 QUALITY ASSURANCE

- A. Perform Work in accordance with applicable code and as supplemented in this section.
- B. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a Professional Structural Engineer experienced in design of work of this type and licensed in Massachusetts.
- C. Perform structural steel design, fabrication, and installation in accordance with AISC 360, Specification for Structural Steel Buildings. Perform seismic design in accordance with applicable code.
- D. Perform welding of steel in accordance with AWS D1.1.
- E. Fabricate and install door and frame assemblies in accordance with NFPA 80.
- F. Perform electrical work in accordance with NFPA 70.
- G. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.
- H. Installer Qualifications: Company specializing in performing the work of this section and approved by elevator equipment manufacturer.
- I. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.11 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide one year manufacturer warranty for elevator operating equipment and devices.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to conformance with the requirements of this section and Section 14 27 05 - Custom Elevator Cabs And Hoistway Doors, provide products from one of the following:

1. Acceptable Manufacturers:
 2. Thyssenkrupp; Product Endura Above Ground.
 3. Otis Elevator Co; Product Hydrofit Hydraulic elevator (with machine room): www.otis.com.
 4. Schindler Elevator Corp; Product 330-A low-rise hydraulic elevator: www.us.schindler.com.
 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. All components to be manufactured by same entity, unless otherwise indicated.

2.02 ELEVATORS

- A. Elevator No.1: Passenger, holeless hydraulic type with cylinder in hoistway.
1. Operation and Controls: Two-stop automatic.
 2. Cab Height: 96 inches.
 3. Hoistway and Cab Entrance Frame Opening Size: 42 x 84 inches.
 4. Door Type: Single leaf, single speed.
 5. Door Operation: Side opening.
 6. Rated Net Capacity: 3500 lbs.
 7. Rated Speed: 100 ft/min.
 8. Clear Net Platform Size: 80 x 65 inches.
 9. Travel Distance: As indicated on drawings.
 10. Number of Stops: As indicated on drawings.
 11. Number of Openings: As indicated on drawings.
 12. Hydraulic Motor and Pump Location: Adjacent to hoistway at lowest floor.
 13. Two post, two or three stage telescoping hydraulic pistons; to fit travel distance and dimensions of hoistway and pit; subject to manufacturer's product limitations.

2.03 CONTROLS

- A. Elevator Controls: Provide landing buttons and hall lanterns.
- B. Door Controls:
1. Program door control to open doors automatically when car arrives at floor.
 2. Render "Door Close" button inoperative when car is standing at dispatching terminal with doors open.
 3. If doors are prevented from closing for approximately ten seconds because of an obstruction, automatically disconnect door reopening devices, close doors more slowly until obstruction is cleared. Sound buzzer.
 4. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equip with photo-electric light rays.
- C. Landing Buttons: Stainless steel type, one for originating UP and one for originating DOWN calls, one button only at terminating landings; marked with arrows.
- D. Landing Position Indicators: Illuminating white.
- E. Car Direction Indicators: Illuminating white.
- F. Interconnect elevator control system with building fire alarm and access control systems.
- G. Access to elevator to be limited at first floor by electronic access control device provided by section 28 0000.
- H. Provide "Firefighter's Operation" 3502 key switch in accordance with applicable code. Designated Landing: First Floor.

2.04 EMERGENCY POWER

- A. Arrange elevator operation to operate under emergency power when normal power supply fails.

- B. Emergency Power Supply:By elevator contractor. Battery back-up
- C. Provide operational control circuitry for adapting the change from normal to emergency power.
- D. Upon transfer to emergency power, advance elevator to lower level landing, stop car, open doors, disable operating circuits, and hold in standby condition.
- E. Provide manual switch to override the automatic selection procedure.

2.05 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Electrical Characteristics:
 1. Maximum 30 hp.
 2. 208 volts, three phase, 60 Hz.

2.06 MACHINE ROOM FITTINGS

- A. Wall-Mounted Frames: Glazed with clear plastic; sized to fit charts listed. Provide one for master electric and hydraulic schematic and one for lubrication chart. Install charts.
- B. Key Cabinet: Wall-mounted, lockable, keyed to building keying system, for control/operating panel keys.
 1. Provide two extra control/operating panel keys.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions per Section 01 40 00 - Quality Requirements, and as follows:
 1. Carefully examine installation areas with Installer/Applicator present, for compliance with requirements affecting Work performance.
 2. Verify that field measurements, substrates, structural support, utility connections, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 3. Verify existing conditions before starting work.
 4. Verify that hoistway, pit, and machine room are ready for work of this section.
 5. Verify hoistway shaft and openings are of correct size and within tolerance.
 6. Verify that electrical power is available and of the correct characteristics.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Arrange for temporary electrical power for installation work and testing of elevator components.

3.03 INSTALLATION

- A. General: Install Elevator Systems according to the Drawings, approved submittals, manufacturer's instructions, MSBC (780CMR), and as follows:
 1. Install system components. Connect equipment to building utilities.
 2. Provide conduit, boxes, wiring, and accessories.
 3. Install hydraulic piping between cylinder and pump unit.
 4. Mount motors and pumps on vibration and acoustic isolators, on bed plate and concrete pad. Place on structural supports and bearing plates. Securely fasten to building supports. Prevent lateral displacement.
 5. Accommodate equipment in space indicated.
 6. Install guide rails using threaded bolts with metal shims and lock washers under nuts. Compensate for expansion and contraction movement of guide rails.
 7. Accurately machine and align guide rails. Form smooth joints with machined splice plates.
 8. Coordinate installation of hoistway wall construction.
 9. Install hoistway door sills, frames, and headers in hoistway walls. Grout sills in place. Set entrances in

vertical alignment with car openings and aligned with plumb hoistway lines.

10. Fill hoistway door frames solid with grout in accordance with Section 04 20 00.
11. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
12. Machine Room Components: Clean and degrease; prime one coat, finish with two coats of enamel.
13. Adjust equipment for smooth and quiet operation.

3.04 ERECTION TOLERANCES

- A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and manufacturer's recommended tolerances.
- B. Cab Movement on Aligned Guide Rails: Smooth movement, with no objectionable lateral or oscillating movement or vibration.

3.05 FIELD QUALITY CONTROL

- A. Testing and inspection by regulatory agencies will be performed at their discretion.
 1. Schedule tests with agencies and notify Owner and Architect.
 2. Obtain permits required to perform tests.
 3. Document regulatory agency tests and inspections in accordance with the requirements of Section 01 40 00.
 4. Perform tests required by regulatory agencies.
 5. Furnish test and approval certificates issued by authorities having jurisdiction.
- B. Perform operational tests in the presence of Owner and Architect.
- C. Operational Tests:
 1. At an agreed time during the contract warranty period, and with the building normally occupied using normal building traffic, conduct tests to verify performance. Furnish event recording of all hall call registrations, time initiated, and response time throughout entire normal working day.

3.06 ADJUSTING

- A. Adjust for smooth acceleration and deceleration of car so not to cause passenger discomfort.
- B. Adjust automatic floor leveling feature at each floor to achieve 1/4 inch from flush.

3.07 CLEANING

- A. Remove protective coverings from finished surfaces.
- B. Clean surfaces and components ready for inspection.
- C. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

3.08 PROTECTION

- A. Do not permit construction traffic within cab after cleaning.
- B. Protect installed products until project completion.
- C. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

3.09 MAINTENANCE

- A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.
- B. Provide a separate maintenance contract for specified maintenance service.
- C. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the elevator manufacturer or original installer.
- D. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of Owner.
- E. Provide service and maintenance of elevator system and components for one year from Date of Substantial Completion.

- F. Examine system components at interval required by code. Clean, adjust, and lubricate equipment.
- G. Include systematic examination, adjustment, and lubrication of elevator equipment. Maintain hydraulic fluid levels. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original equipment. Replace wire ropes when necessary to maintain the required factor of safety.
- H. Perform work without removing cars during peak traffic periods.
- I. Provide emergency call back service during working hours for this maintenance period.
- J. Maintain an adequate stock of parts for replacement or emergency purposes locally, near the place of the Work. Have personnel available to ensure the fulfillment of this maintenance service, without unreasonable loss of time.

END OF SECTION

SECTION 21 00 00

FIRE PROTECTION FILED SUB-BID

PART 1 GENERAL

SUMMARY

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this section shall include all plumbing construction for the Project, including all accessories identified within the specification sections referenced below, and necessary to provide a complete installation.
- B. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - 1. Section 21 10 00: FIRE PROTECTION.
- C. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above

listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.

- D. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- E. Waste Removal/Dumpster: This subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Temporary Weather Protection: The General Contractor shall provide tenting and heat to the work area, including to scaffolding provided by this section, during the months of November through March. This subcontractor shall remain responsible, without exception, for providing heat to masonry materials including unit masonry, sand, water, and other components to assure proper temperatures are maintained prior to installation
- G. Cutting and Patching: This Filed Sub-Bid Subcontractor shall be perform all cutting, coring, and/or patching required to complete the work of this section, except as specifically indicated in respective sections listed as part of the work of this Filed Sub-Bid. Where any of these sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching necessary for the work of this section shall be borne by this Subcontractor. All cutting, coring, and patching shall be coordinated through and by the General Contractor. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- H. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements all sections of the work.

Primary Drawings listed are those intended to indicate the Scope of Work for this trade.

- 1. T-1.1, Site 2, A-1.1, A-1.1 ALT, A-1.2, A-1.3, A-1.4, A-1.4 ALT, A-1.5, FP-1.1, FP-1.2, FP-1.3, FP-1.4, P-1.1, P-1.2, P-1.3, FA-1.0
- l. In addition to the above listed "Primary Drawings" that define the scope of this section, this subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 22 00 - Unit Prices: Descriptions of unit price items, administrative requirements.
- D. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- E. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.

- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 REFERENCE STANDARDS

- A. Refer to individual specification Sections listed above for Reference Standards.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to each individual Specification Section listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 QUALITY ASSURANCE

- A. Refer to each individual Specification Section listed above for additional requirements.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Refer to each individual specification section listed above for specific warranties required.

PART 2 PRODUCTS (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR PRODUCT REQUIREMENTS)

PART 3 EXECUTION (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR EXECUTION REQUIREMENTS)

3.01 CLEANING

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 21-10-00 - FIRE PROTECTION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The awarded contractor is directed to the fact that these are “**PERFORMANCE FIRE PROTECTION – TIER 1 SPECIFICATIONS**”. Contractors’ work shall meet all requirements of the latest edition of NFPA 13, 24, 25, FM Global Standard 2-8N and local fire code requirements.
- B. Provide a complete and fully functional fire protection system including but not limited to all materials and equipment as noted in the Documents.
- C. The sprinkler system shall be designed and installed in accordance with the current NFPA 13, 24 & 25 (Latest Edition), the submitted performance sprinkler documents, all applicable local codes, and shall conform to the regulations and requirements of all authorities having jurisdiction.
- D. The sprinkler system shall be hydraulically calculated per NPFA 13.
- E. The fire sprinkler contractor shall verify available water supply by performing a new flow test after the installation of the new water supply piping to be incorporated into submitted shop drawings for review. Submit final sprinkler system design drawings and hydraulic calculations bearing the stamp of a Registered Massachusetts State Fire Protection Engineer, to Architect and local fire official for approval.

1.2 DESCRIPTION OF WORK

WORK INCLUDED:

- A. Provide all labor, equipment, transportation, implements and materials required to furnish and install a complete and operational fire protection system and all related fire protection work, completed as indicated on Drawings and specified herein. Without limiting the generality thereof, the following are major items of work included.
 - 1. In general the scope shall consist of a new fire service into the building, Double check valve assembly and main alarm wet valve, piping throughout the facility including stairwell standpipes, sprinkler heads, hangers, supports and valves.
 - 2. Extend the sprinkler main and branch pipes to all the sprinkler heads for a complete operational sprinkler system.
 - 3. Preparation of complete “Fire Protection Working Drawings” and calculations with a Registered Fire Protection Professional Engineering Stamp, registered in the State of Massachusetts.
 - 4. Perform and record up-to-date hydrant flow tests.
 - 5. Tests of all piping, systems, devices and alarms.

7. Sleeves, escutcheons, hangers and supports. Seismic bracing.
8. Miscellaneous steel supports
9. All hoisting and rigging.
10. Scaffolding and staging as per 01 50 00 .
11. Identification of systems, equipment and valves.
12. Shop drawings and submittals
13. Permits, fees and inspections.
14. System and equipment start-ups; Owner's instructions.
15. Operation and Maintenance Manuals.
16. Related supports and restraints.
17. User Training
18. The Fire Protection Subcontractor shall furnish and install all such parts as may be necessary to complete all systems, in accordance with the best practice of his trade, as required by Code, specified and shown on the Drawings. He shall complete all work to the Designer's satisfaction at no additional cost to the Awarding Authority.
19. Use only qualified personnel who are thoroughly trained and experienced in the skills required to provide first class workmanship and who are thoroughly familiar with the requirements of this work.
20. The Fire Protection Subcontractor shall give all requisite plans, relating to his work, with proper authorities and shall secure all permits for his work and pay all fees for same.
21. If any work is performed and subsequent changes are necessary to conform to such codes, regulations and ordinances, the changes shall be made at the Fire Protection Subcontractor's expense.

B. Items to be installed only: Not Applicable.

C. Items to be Furnished Only: Furnish following items for installation under designated Section:

1. SECTION 08 31 00 - ACCESS DOORS

- a. Access doors to be installed under applicable sections.

- D. Related Work: The following items are not included in this section and will be performed under the designated sections and as indicated below:
2. SECTION 01 31 14 – PROJECT COORDINATION
 - a. Coring, cutting and patching.
 2. SECTION 01 50 00 – TEMPORARY FACILITIES
 - a. Temporary heat, light, water, power and sanitary facilities for use during construction and testing.
 3. SECTION 03300 – CAST-IN-PLACE CONCRETE
 - a. Pads, concrete bases and form work.
 4. SECTION 07 84 00 - FIRE STOPPING
 - a. All firestopping where required around fire protection pipes.
 5. SECTION 09 90 00 - PAINTING
 - a. Painting of all exposed fire protection equipment not having enameled surfaces, stainless steel or chromed finishes.
 6. SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES
 - a. Fire extinguishers and cabinets.
 7. SECTION 22 00 00 - PLUMBING
 - a. Sprinkler waste outlets.
 8. SECTION 26 00 00 - ELECTRICAL
 - a. All power wiring and alarm of every description to be provided under 16100 Electrical. All starters and controllers for mechanical equipment, except where provided as integral with mechanical equipment, shall be provided under this Section.
 7. SECTION 031 00 00 - EARTH WORK
 - a. Excavation and backfilling
 8. SECTION 33 11 14 - CONNECTION TO EXISTING WATER MAINS

Exterior water service piping 10'0" beyond points indicated on the drawings.

1.3 CODES, PERMITS AND INSPECTIONS

- A. The Fire Protection Subcontractor shall coordinate with the General Contractor the installation of the Fire Protection Systems.
- B. All work shall meet or exceed the latest requirements of all National, State, County, Municipal and other authorities exercising jurisdiction over the construction work at the project, NFPA 13, 24 & 25 (Latest edition), Massachusetts State Building Code and Massachusetts General Laws
- C. All necessary permits and fees to local municipalities shall be provided by the Fire Protection Subcontractor.
- D. Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Act (OSHA) and the Department of Public Safety. Where provisions of the Contract Drawings conflict with any code, rules, and regulations, the contract provisions shall govern unless the Designer rules otherwise.
- E. The Fire Protection Subcontractor shall give the proper authority all required notices or information relating to work in his charge, pay all fees and obtain all official licenses, permits and certificates prior to commencing any installation.

1.4 EQUIPMENT AND MATERIALS

- A. Refer to Section 01600 - MATERIALS

1.5 INTENT

- A. **The Contract Drawings are diagrammatic only, all work shall be accurately laid out with other trades to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance and head room.**
- B. The Drawings are not intended to be rigid in specific details. Where they may be in conflict with Code Requirements or any applicable ordinance, or with recommendations of the manufacturers of any equipment actually furnished, it will be the responsibility of this Fire Protection Subcontractor to resolve.
- C. It is the intent to conceal all piping where possible. Where exposed, seek approval from architect before installation, if approved, install in neat, professional manner.

- D. The project's intent is to install a complete operational sprinkler system in all areas. Due to the nature of the occupancy, continual changes to ceiling and wall layout occur. Therefore, the drawings are diagrammatic only, with the intent that all areas be provided with sprinkler protection. It is the responsibility of the Fire Protection Subcontractor to provide complete and accurate shop drawings with reflected ceiling plan showing ceiling type and layout along with lights, vents, walls, etc. along with coordinated sprinkler piping and head layout for all areas. It is the Fire Protection Subcontractor's responsibility to provide complete sprinkler coverage throughout. Where Architectural Drawings indicate locations of sprinkler heads and other items, provide locations indicated unless Designer approves otherwise.
- E. Substantial differences between the contract documents and existing conditions with respect to room configuration due to the addition or elimination of walls/partitions shall be brought to the attention of the Architect and Engineer prior to commencement of work for a determination of appropriate action.
- F. The working plans shall include all requirements as per NFPA 13, 24 & 25 (Latest Edition).

1.6 WORKING PLANS

- A. After visit to site, Subcontractor shall study building architectural, structural, mechanical, reflected ceiling and electrical plans and prepare "Fire Protection Working Drawings" in conformance with NFPA and the requirements of the Department of Public Safety.
- B. Working plans shall show sections, pipe hangers, heating units, ductwork, electric lighting fixtures, diffusers and indicate a coordinated layout of heads and mains with these components. This is critical since the available space is restricted, and coordination is critical. For this reason, the timing of [the Final Approval of] these drawings is critical, and should be done during the first stages of the project.
- C. Submit the appropriate number of sets of finished working plans, with the Fire Protection Subcontractor License Number and stamped by a qualified Registered Fire Protection professional engineer registered in the State of Massachusetts, and all the necessary and required calculations [including flow tests] to authorities that have jurisdiction including:
 - 1. Architect/Engineer
 - 2. Department of Public Safety [DPS]
 - 3. Local Fire Department [including flow tests]
- D. Working plans shall be subject to Designer's final review, and drawn to scale no less than 1/4 inch = 1 foot on sheets of uniform size. Plans shall show all design data required by the appropriate NFPA pamphlets and the underwriter.
- E. Prior to performing the Fire Protection Working Drawings, obtain an approved copy of the Mechanical "Coordination Drawings", and incorporate all pertinent information.

- F. Fire Protection working drawings and calculations shall have been reviewed by the Architect and Engineer and approved by the Department of Public Safety and the Fire Department prior to fabrication/installation. Any deviation from this process shall be entirely at the Subcontractor's risk.
- G. Prior to performing the Fire Protection Working Drawings and Calculations conduct proper independent flow tests to verify conditions and the preliminary design herein. Coordinate flow tests with the local water authority's requirements. If the local authority will not allow the flow tests we recommend that the Subcontractor submit the most recent/reliable test data to the Department of Public Safety for approval. Massachusetts requires all flow tests used to be within 12 months of the installation.
- H. The Subcontractor shall assume that modifications to the calculations and fire protection working drawings will be required, and shall have made such allowance in his project cost.
- I. As an aid in the bidding process, and to assist in the coordination of the building systems, the fire protection contract drawings may indicate a piping layout with pipe sizes and sprinkler heads indicated. The Fire Protection Subcontractor is cautioned that this is a "preliminary design", for the above stated purposes, and that all of the flow test, sizing and related requirements indicated herein apply to the Fire Protection Subcontractor's final design requirements. In addition, it shall also be pointed out that all piping, heads and offsets may not be indicated and that the Fire Protection Subcontractor is fully responsible for the final complete installation.

1.7 DRAWINGS

- A. The Plans are diagrammatic only and are not intended to show every outlet, fitting and accessory required to provide completely finished systems. It is the intent of these Specifications and Drawings to provide that work and all parts thereof shall be, when fully completed, suitable in every way for the purpose for which it was designed. The Fire Protection Subcontractor shall supply, at no extra cost, all materials, equipment, accessories, and do all the work which may be reasonably implied as being incidental to the work of this Contract. The Drawings and Specifications are complimentary, and that is shown and called for by one, shall be as binding as if called for by both. Leave adequate space around equipment. Sprinkler heads indicated as a general and preliminary guide and all heads may not be indicated.

1.8 OPERATING INSTRUCTIONS AND MAINTENANCE MANUAL

- A. Refer to Section 01700 - CONTRACT CLOSE-OUT.
- B. Each manual shall contain the following information:
 - 1. Description of each system, with description of each major component of the system.
 - 2. Complete sets of page-size equipment shop drawings including any control drawings.
 - 3. A lubrication schedule of all specified equipment.

4. Spare parts list.
5. Equipment identification list with serial numbers.
6. Page-size valve tag schedule and flow diagrams.
7. A copy of the pertinent NFPA pamphlets [as applicable to design].
8. Names, addresses and phone numbers of all suppliers and service personnel for all equipment.
9. Copies of all product equipment and system guarantees from manufacturers, including signed written guarantee of systems from this Subcontractor.
10. Copy of all pertinent NFPA system maintenance manuals.
11. A schedule of system maintenance and testing [such as BFP's, Alarms, drains, etc.].

1.9 MATERIALS STANDARDS

- A. Unless otherwise specified, materials and equipment shall conform to and be listed in the editions of the following standards in effect at the date of advertisement for bids:
 1. NFPA National Fire Protection Association
 2. OSHA Occupational Safety and Health Act
 3. UL Underwriter's Laboratories
 4. EPA Environmental Protection Agency
 5. NEC National Electric Code

1.10 EQUIPMENT AND MATERIALS

1.11 HYDRAULIC CALCULATIONS

- A. The entire building will be sprinklered with the exception [only if granted by the authority having jurisdiction] of the electric rooms.

- B. Before any work is commenced, shop drawings shall be carefully prepared and submitted for approval. It is required that the sprinkler systems be sized hydraulically in accordance with NFPA standards and as indicated below. Submit hydraulic calculation of each system for each shop drawing, showing balanced system delivery, and balanced supply and demand, as defined for the required hazard areas and in NFPA 13 & 14, latest edition. Such drawings and calculations must be reviewed and approved by all governing authorities, Fire Department and Building Underwriters before any work is commenced at the job site. The mains and risers supplying the fire department valves will remain as sized on the Drawings. Contractors shop drawings submitted to governing authorities must bear a registered Fire Protection Professional Engineer's stamp and signature.

Densities shall be listed for the most hydraulically demanding areas. Include hose stream demands with all calculations.

- C. Hydraulic calculations for the sprinkler system shall be based on NFPA 13 and the Governing State Building Code. Hazard classifications shall be determined and defined for this building.
- D. The hydraulic calculations shall include all requirements as specified in NFPA 13 (latest edition)

1.12 MAXIMUM COVERAGE PER SPRINKLER HEAD

- A. Sprinkler coverage spacing shall be in accordance with NFPA 13, for the applicable occupancy and density along with conformance to the listing of the specific sprinkler head[s] being utilized.

1.13 FIRE FLOW TEST

- A. The Fire Protection Contractor will conduct an up-to-date fire flow test indicating the static and residual pressures in the water mains used for fire service with certified flow volumes at the time of the test. Tests must be conducted at or near peak demand times. The Fire Protection Contractor shall pay all fees associated with an up-to-date test.
- B. This data must be used for all hydraulic calculations and shall be documented on his submitted shop drawings.
- C. The water test data shall be shown on the contract documents in the form as follows:

Hydrant Flow Test conducted by:-----

Location of Flow and Static: -----

Date: -----

Flow: -----

Static: -----

Residual: -----

Flow at 20 psi: -----

1.14 UTILITY SERVICES

- A. All arrangements and fees required to bring fire services into the building shall be made by the Fire Protection Contractor.
- B. It shall be ascertained what materials and/or labor will be provided by the utility company and/or city authority and any fees in conjunction therewith shall be paid.
- C. All services shall be installed in accordance with the provisions of the local authorities having jurisdiction and the Fire Protection Contractor shall obtain all necessary approvals.
- D. The term fire service, as used herein, includes service to sprinkler protection.

1.15 RECORD DRAWINGS

- A. Refer to Section 01700 - CONTRACT CLOSE-OUT

1.16 GUARANTEE

- A. Refer to Section 01700 - CONTRACT CLOSE-OUT

1.17 CONTRACT COST BREAKDOWN

- A. No requisitions will be paid until after the cost breakdown is delivered to the Designer.
- B. Refer to Section 01300 - SUBMITTALS.

1.18 PERMITS, FEES, INSPECTION, CERTIFICATES

- A. Apply for, obtain and pay for all permits, inspections and fees required.
- B. Obtain permit for the work from Local Fire Department.
- C. Be fully acquainted with and obey all State and Municipal laws, bylaws, codes and regulations, and all authorities having jurisdiction.
- D. Before starting any work, submit the required Specifications and Drawings to the local Fire Department and the Department of Public Safety. Comply with any requested changes as part of the Contract, and give any notification immediately of such changes.
- E. Where the Specifications, Instructions, Local Fire Department, or the Department of Public Safety, require any work to be tested, inspected or approved, give sufficient notice of its readiness for inspection, and, if the inspection is by Local Fire Department and the Department of Public Safety, of the date and time set for such inspection.
- F. Inspection will be made promptly. If any work is covered up without consent, it shall, if required, be uncovered for examination and made good at no extra cost to the Owner.
- G. Furnish all certificates necessary as evidence that the work conforms to the requirements of the local fire Department and the Department of Public Safety.

1.19 SHOP DRAWINGS

- A. Refer to Section 01300 - SUBMITTALS
- B. Present, after award of the Contract, a list of Shop Drawings to be submitted with the name of each manufacturer and supplier.
- C. Shop drawings shall be submitted for all items and equipment furnished under this Section in the specifications and on the drawings.
- D. Do not manufacturer, deliver or install equipment and materials until final review of Shop Drawings has been completed.
- E. Submit for review, one sepia and the proper number of copies of certified Shop Drawings of the "Fire Protection Working Drawings" and all equipment, materials, equipment wiring diagrams, motors, starters, controls, and schedules. Ensure that sepias have adequate clear space for all stamps. When requested, resubmit drawings promptly.
- F. Be responsible for presenting the processing of shop drawings to suit manufacturing schedule of equipment and construction schedule of equipment and construction schedule of the building. Allow for reasonable engineering review and resubmittal time.
- G. Be responsible for accuracy of equipment dimensions relative to available space, the performance and the electrical characteristics. When required, submit a complete comparison between accepted alternative equipment and materials, and that which is specified.
- H. Each Shop Drawing shall indicate clearly the correct name and address of the project, the intended use and location of the equipment, and the specification designation number.
- I. Upon receipt of reviewed Shop Drawings, distribute prints to all trades and manufacturers affected.
- J. Submit Shop Drawings to authorities having jurisdiction.
- K. Keep one set of the reviewed Shop Drawings and "Fire Protection Working Drawings" on the site at all times.
- L. Prior to submission of Shop Drawings, the Fire Protection Subcontractor shall thoroughly check each shop drawing to ascertain that it complies with the Contract requirements; that the electrical characteristics are correct, and that the dimensions of work submitted fit the available space. Any deviations from the Contract requirements shall be clearly noted on the Shop Drawings. The Fire Protection Subcontractor shall stamp each submittal with his firm's name, date and approval, thereby representing that the above has been complied with.

Shop Drawings not so checked and stamped shall be returned without being examined by the Designer. Review of the Shop Drawings shall not relieve the Fire Protection Subcontractor from the responsibility of the Fire Protection Subcontractor whether the drawings are reviewed or not.

- M. The Fire Protection Subcontractor shall submit to the Designer, for transmittal to the Owner, all samples requested by the Owner. Submittal, review, and approval of samples shall be in accordance with the Conditions of the Contract.
- N. Bind one set of the corrected "Reviewed" Shop Drawings in each Operation and Maintenance Instructions Manual.
- O. Before work progresses, coordinate with and obtain approved copies of the HVAC Subcontractor's "Coordination Drawings" and, in addition to the Shop Drawings listed hereinafter, Shop Drawings shall be prepared by the Fire Protection Subcontractor at a suitable scale not less than 1/4 inch equals one foot.
- P. Composite systems drawings shall show how Fire Protection systems are to be installed and where conflicts with the work of other trades may occur. The Subcontractor, before transmittal of the Shop Drawings to the Owner for approval, may require the Fire Protection Subcontractor to revise the composite systems and shop drawings and to make reasonable modifications in the layout of the Fire Protection work, so that the Fire Protection may be properly accommodated without the interference with work of other trades. The Fire Protection Subcontractor shall make such revisions to composite systems shop drawings, when requested, without extra charge.
- Q. Coordination shop drawings shall be done for changes in the Fire Protection and adjoining work where an approved substitution of the Fire Protection equipment requires such changes in the Fire Protection work or in the adjoining work of any other trade.
- R. Coordination shop drawings shall be done for concrete equipment bases and for any other work to be performed by other trades as required for the installation of Fire Protection work.

1.20 LICENSING AND APPROVAL

- A. All work shall be performed by personnel licensed to install such systems in the State of Massachusetts by the Department of Public Safety, Division of Inspections. All work shall be approved by the same department.

1.21 SITE INVESTIGATION

- A. It shall be the responsibility of the Sub-Bidders to acquaint themselves with the available information, before submitting their bid. Sub-Bidders must visit the site and acquaint themselves with the existing conditions and shall study all Architectural, Fire Protection and Electrical Drawings, as well as the Specifications. The Sub-Bidders shall fully inform themselves of all local and state code requirements. Extra compensation will not be given for items missed or obvious conflicts apparent at the time of the start of the project.
- B. Refer to Section 01010 - SUMMARY OF WORK.

1.22 TEMPORARY SERVICES

- A. Refer to Section 01500 - TEMPORARY FACILITIES.

PART 2 - PRODUCTS

2.1 PIPE FITTINGS AND JOINTS

- A. The piping systems and all fittings and components shall be rated for the working pressures involved. The piping systems and equipment specified herein may not all be related to this project and are documented for general use as a guide. Contractor shall submit for approval all piping and equipment before ordering.
- B. All piping shall conform to ASTM Standards and shall be UL listed and FM approved for fire service; piping shall be marked accordingly.
- C. Victaulic, Gustin-Bacon and Grinnel, or equal. "Victaulic" fittings and couplings are used throughout to establish a specific criteria and level of quality.
- D. Service: Buried fire service.
- Pipe Material: Ductile iron, standard thickness cement mortar lining Class 52.
- Fitting Material: Cast or ductile iron 250 psi rating, standard thickness cement mortar lining.
- Pipe Joint: Push-on. Install flexible couplings on exterior side of foundation wall. All changes in direction to have tie rods and clamps anchored to thrust blocks in accordance with NFPA 24.
- E. Service: Fire Service lines in service entry, mechanical, rooms, exclusive of sprinkler piping, all risers, and the distribution to those risers, exclusive of drain and test risers.
- Material: Schedule 40 black steel, roll grooved ends [cut grooving shall not be allowed].
- Fittings: Victaulic Style 07 "Zero-Flex" couplings in equipment rooms; Style 005 for standpipes and risers; Style 77 standard flexible couplings at pumps and vibration-producing equipment; Style 741 "Vic-Flange" adapters at all valves and equipment connections.
- F. Service: Sprinkler and fire service piping through 5 inches.
- Material: ASTM-135, Schedule 10 steel, roll grooved ends

[Cut grooving shall not be allowed].

- Fittings: Victaulic full flow malleable iron, ductile iron, steel or segmentally welded steel with grooved or shouldered ends.
- Couplings: Victaulic Style 75 couplings; Style 72 outlet couplings; Style 741 "Vic-Flange" at equipment and valves 2 1/2 inches and larger.
- G. Service: Sprinkler piping, exposed to view in occupiable/habitable areas, and all threaded lines.
- Material: Schedule 40 steel with threaded ends.
- Fittings: Full flow malleable iron, cast iron or steel; exposed.
- H. Service: Sprinkler drains, inspector's test connection lines, exclusive of risers.
- Material: Connections to sprinkler lines, valves and test stations: Schedule 40 steel, threaded.
- Drain and test risers: ASTM-135 Schedule 10 steel, roll grooved ends [cut grooving shall not be allowed].
- Fittings: Full flow malleable iron, ductile iron; steel or segmentally welded steel; screwed fittings as applicable; Victaulic fittings with grooved or shouldered ends as applicable.
- Couplings: Victaulic Style 07 "Zero-Flex" couplings for risers; Style 75 Standard flexible couplings for horizontal runs; Style 72 outlet couplings for connections to sprinkler lines and test or drain risers. [Style 920 "Mechanical-T" threaded U-bolted branch outlets may be utilized in lieu of Style 72 outlet couplings in this application.]
- I. Service: Piping to water motor gong.

- Material: Schedule 40 galvanized steel or Schedule 40 Seamless red brass; threaded.
- Fittings: Galvanized iron or brass, as applicable, Screwed.
- J. Gaskets: Victaulic couplings shall be provided with Grade "E", EPDM gaskets.
- K. Reducers: Reducing fittings shall be used throughout; the use of reducing couplings shall not be allowed.
- L. Expansion: When crossing building expansion joints, expansion loops, as required, shall be installed with the appropriate couplings to allow for expansion in agreement with that as provided for by the building joint. Piping shall be securely anchored to the building structure on both sides of the expansion loop
- M. Threading: Threaded joints may be substituted for grooved ends and Victaulic couplings; however, shall be limited to Schedule 40 piping. NOTE: Threading of piping less than Schedule 40 shall not be allowed.

2.2 VALVES

- A. Valves shall be of standard weight and materials as required by NFPA, UL listed, FM approved. Jenkins, Mueller, Victaulic or equal.
- B. Initial control valve inside the building shall be OS&Y type, 175 psi; no substitution allowed.
- C. Gate Valves 2 1/2" and Larger: Gate valves shall have iron body, bronze mounted, straightway pattern, OS&Y flanged ends, 175 PSI WWP; Jenkins Brothers Figure No. 825-C. Victaulic No. 708 UL/FM butterfly valves may be substituted except where NFPA/Underwriter specifically requires an OS&Y valve.
- D. Gate Valves 2" and Smaller: Gate valve shall have bronze body, OS&Y, screwed ends, 175 PSI WWP; Jenkins Brothers Figure No. 275-U. Victaulic No. 727 UL/FM "Fireball" valve may be substituted.
- E. Globe Valves: Globe valves shall be bronze body with screwed ends, suitable for 300 pounds non-shock cold water, similar to Jenkins Brothers Figure No. 106-A.

- F. Check Valves 2 1/2" and Larger: Check valves shall be swing type with cast iron body, bronze mounted, flanged ends, suitable for 175 pounds working water pressure, similar to Jenkins Brothers Figure No. 729-C, tapped for automatic ball drip as required.
- G. Check Valves 2" and Smaller: Check valves shall be of the silent type, No. 203-A-T as manufactured by Mueller Steam Specialty.
- H. Tamper switches shall be provided on all normally open valves, DPDT, self-restoring type.
- I. Flow switch assembly [shot gun riser] shall be as indicated on the drawing. See drawings for details.

2.3 SEISMIC PIPE HANGING REQUIREMENTS

- A. Seismic protection of all fire protection piping shall comply with the requirements of NFPA 13 and BOCA Seismic Hazard Exposure.
- B. The Subcontractor shall have the option of substituting alternate seismic supports and anchors; provided his submittals are accompanied by calculations and shop drawings signed and sealed by a licensed structural professional engineer registered in the State of Massachusetts.
- C. All mechanical materials and equipment including all pipe 2 1/2" and larger shall be supported and anchored to resist the external seismic forces for BOCA seismic hazard exposure. Force shall be resisted without failure or permanent displacement when it is applied in any direction and shall conform to section 1612.6 of the 1993 BOCA code.

2.4 SLEEVES AND ESCUTCHEONS

- A. All pipes passing through floors, walls, or partitions shall be provided with sleeves having an internal diameter one inch larger than the outside diameter of the pipe or insulation on covered lines.
- B. Sleeves through outside walls shall be Schedule 40 black steel pipe with a 150 pound black steel slip on welding flanges, welded at the center of the sleeve and shall be painted with one coat of bitumastic paint, inside and outside.
- C. Sleeves through masonry floors and interior masonry walls shall be Schedule 40 black steel pipe.
- D. Sleeves through interior non-masonry walls or partitions shall be 22 gauge galvanized sheet steel.
- E. Inserts shall be individual or strip type of pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4 inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 1/2 inch diameter to be passed through the insert body. Strip inserts shall have attached rods with hooked ends to allow fastening to reinforcing rods.

- F. Unless otherwise specified herein, escutcheons shall be cast brass chrome plated type and provided with a set screw to properly hold escutcheon in place.

2.5 SPRINKLER ACCESSORIES

- A. Water motor gong shall be hydro-mechanical alarm type and energized by water flowing from the wet pipe valve, UL and FM approvals, as manufactured by Central Sprinkler Co., Potter-Roemer, Grinnell, or equal.

- B. Sprinkler Heads

- 10. All sprinkler heads and escutcheons to have satin chrome finish. Covers, where installed, to be white.

- C. Water Pressure Gauges

- 1. Water pressure gauges of the double spring Bourdon type, as manufactured by U.S. Gauge, American, Mueller, Trerice, Ashcroft or equal, shall be installed in the sprinkler system. The gauges shall have a six inch diameter face with brass case and shall be Underwriters' approved.
 - 2. Gauges shall be controlled by a valve with arrangements for drainage. An outlet, at least one quarter of an inch in size, plugged for the installation of the inspector's gauge shall be located between each valve and gauge.
 - 3. Dial graduations reading in "psig" shall be such that the normal operating pressure of the system installed shall be indicated near the middle of the scale.
 - 4. The accuracy of the gauges shall be within one (1%) percent of the scale range.

2.6 SPARE HEADS AND CABINETS

1. Sprinklers shall be in conformance with NFPA 13. Sprinklers in Light Hazard & Ordinary Hazard areas shall have a temperature rating of 165 degrees F. In areas subject to abnormal heating conditions, sprinklers shall have a temperature rating adequate to prevent accidental discharge.
2. Sprinklers shall be the upright type in areas without suspended ceilings and shall be the recessed, pendant type in areas with suspended ceilings. Sprinklers in suspended ceiling areas shall be located as close to center of ceiling tiles as possible.
3. Sprinkler heads shall be located in interstitial spaces, spaced at 12' x 12' and calculated per the manufacturers recommendations
4. At project completion, provide six (6) spare sprinklers of each type, and necessary pipe wrench(s) in a metal cabinet next to sprinkler riser. The spare sprinklers shall correspond to the types and temperature ratings of the sprinklers installed.
5. The Subcontractor shall refer to architectural plans and schedules to verify ceiling types and heights for areas of construction and for final locations of all sprinkler heads. If additional heads are required, beyond what is shown, Provide the required heads and
6. coordinate there final locations with the designer.

All recessed sprinkler heads shall be of the adjustable type.

7. All heads shall be centered in tiles, and with other ceiling objects, unless specifically denoted otherwise, where ceilings are installed.

Sprinkler head locations shall be coordinated with all surface mounted items, such as cornices, low soffits and lighting fixtures and shall be located accordingly. Extended escutcheond may be utilized where heads cannot be moved, if acceptable to the designer.

8.
 - A. Provide where directed by the Designer, a metal cabinet in the building containing spare sprinkler heads and wrenches.
 - B. 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.
 - C. 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.

- E. The cabinet size and number of each type spare sprinkler head shall conform to the National Fire Protection Association Pamphlet No. 13.

2.7 BACKFLOW PREVENTER

- A. Provide and install a Double Check Valve Assembly equal to Watts series 709. Wilkens, Febco or equal

2.8 ACCESS PANELS

- A. All work shall be installed so that all parts requiring inspection, operation, maintenance and repair are readily accessible. Minor deviations from the drawings may be made to accomplish this, but changes of magnitude shall not be made prior to written approval from the Designer.
- B. Furnish access panels and doors for installation in walls and ceilings at locations indicated on the Drawings and as required to permit access for adjustment, removal or replacement and servicing of all valves and equipment.
- C. Access panels and doors shall be installed under other appropriate Sections for the surface or construction upon which the panels are located. Section 04101 Masonry, Section 09250 Gypsum Drywall.
- D. All access panels and doors shall be located in closets, storage rooms and/or other non-public areas, in a workmanlike manner, positioned so that the junction can be easily reached and the size shall be sufficient for this purpose [minimum 12 inches by 16 inches]. When the access panels and doors are required in corridors, lobbies or other occupied areas, they shall be located as directed by the Designer.
- E. Access panels and doors shop drawings shall be submitted to the Designer for review.
- F. This Subcontractor shall inform the Applicable Section Subcontractor where access is required through ceilings in order that special clips for access can be provided.
- G. Access panels and doors shall be rated as required to maintain rating of surface they are installed in.
- H. This Subcontractor shall coordinate with the General Contractor to ensure that all access panels on the project have cylinder locks that are keyed alike.

2.9 MISCELLANEOUS

- A. The miscellaneous components shall be manufactured by Reliable, Grinnel, Viking or equal. Reliable is used throughout to set a specific criteria and a level of quality.
- B. Furnish all other accessories required, as per NFPA #13, including:

1. Sprinkler Guards: Reliable Model C1 [on all heads in mechanical room, stairs, storage rooms].
2. Sight Drains: Reliable Model B, one inch, to suit.
3. Signs shall be as per NFPA 13.

2.10 FIRE DEPARTMENT CONNECTIONS

Storz connection as approved by Westwood Fire Department

PART 3 - EXECUTION

- 3.1 GENERAL: All system installation shall comply with the latest editions of the Standard for the Installation of Sprinkler Systems, NFPA No. 13. Include all items of labor and materials required to meet such standards regardless of the commission of these items in these Specifications or on the Drawings. Where quantities, sizes, or other requirements herein specified are in excess of the NFPA Standard's requirements the Specifications shall govern. Install drains on all main rises in accordance with NFPA and at all low points such that the entire system can be drained.
- 3.2 SPRINKLER HEADS: Install new sprinkler heads and connect piping. Verify that temperature ratings are correct as specified.
- 3.3 ALARM BELLS: Install new electric alarm bell
- 3.4 FIRE DEPARTMENT CONNECTIONS: Install new Fire Department Connections as required by Islington Fire Department
- 3.5 DRAINS
- A. Install inspector's test drains on wet pipe sprinkler systems as required by Code.
 - B. Drain valves shall be piped to a safe place and the discharge shall be visible either by open-end drain pipe or sight drain fitting.
 - C. Identification signs of standard design shall be installed and fastened securely at designated locations in accordance with NFPA, and at all drain and inspector's valves.
 - D. Install flushing connections in accordance with NFPA.
- 3.6 GENERAL INSTALLATION REQUIREMENTS
- A. Piping Installation
- Sprinklers shall be located as follows:
- 1. In Storage areas, sprinklers shall be spaced at a 100 sq. ft. maximum with sprinkler heads at a maximum of 10'-0" apart and spaced at a maximum of 6'-0" from all walls.
 - 2. In light hazard areas, sprinklers shall be spaced at a maximum 225 sq. ft. with sprinkler heads at a maximum of 15'-0" apart and spaced a maximum of 2'-6" from all walls.

Sprinkler system testing shall be in accordance with the requirements of NFPA 13 and jurisdictional authorities. Sprinkler piping shall be tested and made watertight prior to painting and concealment as required during progress of work. Sprinkler system shall be tested under a pressure of 200 psi or 50 psi above maximum system working pressure, whichever is greater, for two hours. All leaks shall be immediately corrected. Caulking is not allowed for sprinkler system leak prevention. The Sprinkler contractor shall notify the General Contractor, Landlord, Architect and local jurisdictional authorities prior to system testing.

Copies of literature and instructions from system equipment manufacturers describing proper operation and maintenance of equipment, and a completed copy of NFPA document 25, "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems," bound in a three-ring binder properly labeled; and, provide two (2) copies of the approved sprinkler system design plans, bearing the approval of the jurisdictional authority. One (1) copy shall be included with as-built drawings in the plan tube located in the Telecom Room and one (1) copy provided with project closeout.

B. Hanger Installation

1. All hangers and supports shall be in conformance with NFPA 13. 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. Maximum spacing of hangers on runs of pipe (vertical and horizontal) having no concentration of weight shall be as follows:
 - a. Schedule - Hanger spacing in feet/pipe material.

Pipe Size (Inches)	Iron or Steel
1/2	5
3/4	6
1	7
1 1/4	9
1 1/2	9
2	10
2 1/2	11
3	12
3 1/2	13
4	14

3. For sprinkler systems hangers shall be approved black malleable iron, heavy-duty pattern having two (2) parts bolted together.

C. Installation of Sleeves, Inserts and Escutcheons

1. Sleeves in floors shall be 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. Field drilling for inserts required for work under this Section of the Specifications shall be provided by this Subcontractor.
4. Each interior wall or partition sleeve shall be packed with foam or glass wool to within one inch of each face of wall and the remaining portion of each end of sleeve shall be sealed with mineral fiber rope.

D. Valve Installation

1. Location of Valves: These shall be valves where indicated on the Drawings.
2. Shut-off valves in the Sprinkler System shall be installed at the base of each riser, in each sprinkler main on each floor, where indicated on the Contract Drawings, required by NFPA Pamphlets 13.

E. Installation of Gauges and Thermostats

1. Thermometers and pressure gauges shall be installed in such a manner as to cause a minimum restriction to the flow in the pipes and so that they can be easily read from the floor.
2. Pressure gauges in the sprinkler systems shall be installed where required.

F. Pressure gauges shall be where required by NFPA 13.

G. Final sprinkler system test shall be witnessed by City Representatives and the Owner's Representative. Valves shall be properly adjusted for maximum pressure setting allowable as required and a typewritten report of such tests and adjustments shall be submitted to the Designer.

H. Signaling devices shall consist of the following:

1. Electric micro switch locks on flow valves and water flow control switches shall be wired to the fire alarm panel.
2. Alarm devices shall be provided on alarm valves and pipes by this Subcontractor.
3. Fire alarm zone panels and wiring shall be provided by the Electrical Subcontractor.
4. Complete coordination shall be exercised between the Fire Protection Subcontractor and the Electrical Subcontractor to ensure electrical connections are compatible with fire alarm described under the Electrical Section.

- I. Complete and submit all necessary certificates and documentation of testing.

3.7 TESTING

- A. Testing and flushing of the fire protection systems shall be done at the expense of this Subcontractor and with equipment furnished by him. Testing shall be done in the presence of duly authorized inspectors and representatives of the Designer and the Owner within forty-eight [48] hour notice given those authorities. Prior to testing, the system shall be thoroughly flushed with clean water.
- B. The system shall be repaired and retested until made perfect, without additional expense to the Owner.
- C. To test piping, subject it to a three-hour hydraulic test of 200 psi, and as required by NFPA. Piping shall be repaired until such tests show no leaks. Where required, and depending on the building's timing and schedule, the system may be required to be tested without final swing elbows and heads installed. In this case, a second test will be required upon installation of swing elbows and heads.
- D. Material and test certificates must be signed by the Resident Engineer prior to and upon completion of testing. Final test reports must be approved in writing by local authorities.
- E. Results of tests shall be recorded and submitted using the forms in NFPA #13, for review by the Engineer. The Material and Test Certificate shall also be sent to the Owner and the Department of Public Safety.
- F. This Subcontractor shall ensure that the underground piping from the street main and service entry piping has been tested to 200 psig in accordance with NFPA 24 requirements. This shall be recorded separately from the interior piping. Coordinate this with the site water piping installer.
- G. Provide all necessary and appropriate personnel to participate in and coordinate fire protection systems with all fire alarm testing, or other systems testing which may interface with fire protection system. Participation shall include all preliminary testing, walk-through testing prior to official walk-through testing and any re-testing if required.

3.8 CLEANING AND BLOWING OUT

- A. All equipment and piping installed under this Section shall be blown out under pressure and cleaned of foreign matter and witnessed by Designer/Owner Resident Engineer, before the system is placed in service.

3.9 START-UP SERVICE

- A. When the equipment listed herein has been completely piped up, wired and ready for operation, this Subcontractor shall contact the supplier's or manufacturer's authorized representative, who as soon thereafter as possible shall visit the project and place the equipment in operation, making such adjustments as may be necessary to provide satisfactory performance.
- B. Before the following equipment is accepted, this Subcontractor shall furnish the Designer with a written statement from the supplier or manufacturer's authorized representative indicating that the equipment was started up by them and was left in a satisfactory manner.

3.10 PAINTING

- A. Supply ferrous metal work, except piping, with at least one factory prime coat.
- B. This Subcontractor shall touch-up, with spray paint, all scratched or damaged surfaces of equipment with factory finish. Spray paint shall be the same color and type as factory finish.
- C. This Subcontractor shall furnish and install approved protective "bags" neatly and tightly secured over each sprinkler head, for protection during painting and other finish work. Remove bags when painting is complete.
- D. Prime coat materials shall conform to the Section PAINTING - 09 9010 of the Specification.
- E. All finish painting will be done under the Section PAINTING - 099010 of the Specification.

3.11 CONNECTIONS TO EQUIPMENT

- A. Provide unions or flanges at all connections to equipment. Ensure that piping adjacent to equipment is readily removable for servicing and/or removal of equipment, without shutting down the entire system.
- B. Install unions in piping up to and including 2 inch pipe size. Install flanges in piping 2 1/2 inch pipe size and larger.
- C. Prevent galvanic corrosion by isolating copper and steel. Use red brass adapters, or completely isolate flanges using full face gaskets with bolts installed through phenolic sleeves with insulating fiber washers.

3.12 BACKFLOW PREVENTER PERMIT AND INSTALLATION

- A. Provide all proper required materials to obtain Permit from Authorities Having Jurisdiction

3.13 WATER SERVICE ENTRANCE

- A. Coordinate with SPRINGFIELD Water Department and provide all necessary materials and documentation requested

3.14 COMPLETION

- A. Remove oil and dirt from equipment surfaces and bases.
- B. Clean all items and equipment.
- C. Leave fire protection work in a new, working order.
- D. Check and align all pumps to manufacturer's acceptable tolerances.

3.15 INSTRUCTIONS TO THE OWNER

- A. After completion of assembly and installation of all systems, equipment and piping required under this Section of the Specifications, the Owner's supervisory and operating personnel shall be instructed regarding the operation and maintenance of the systems. The instruction shall be given by the Fire Protection Subcontractor and other qualified personnel who are thoroughly familiar with all systems. The instruction period shall last as long as necessary and shall be video taped for the Owner's use.
- B. Submit to the Owner, lists for each system or piece of equipment indicating that all components have been checked and are complete prior to instruction period.
- C. Thoroughly instruct the Owner's authorized representative in the safe operation of the systems and equipment.
- D. Submit a complete record of instructions given to the Owner. For each instruction period, supply the following data:

1. Date
 2. Duration
 3. System of equipment involved
 4. Names or persons giving instructions
 5. Names of persons being instructed
 6. Other people present
- E. Arrange and pay for the services of qualified manufacturer's representatives to instruct the Owner on specialized portions of the installation and specialized systems.

3.16 INSPECTION

- A. Periodic inspections of the work in progress may be made to check general conformity of the work to the Drawings and Specifications.
- B. Correct all deficiencies immediately upon notification.

3.17 SPECIAL DESIGN CONSIDERATIONS

- A. Perform hydrant flow tests, satisfactory to NFPA and the Underwriter's requirements, and in conformance with the timing and requirements of the Local Water and Sewer.
- B. In general, electric closets, electric rooms and telephone rooms will have heads unless otherwise eliminated by the local building inspector.
- C. The systems shall be hydraulically designed and supported by hydraulic calculations. Fire Protection Working Drawings and complete hydraulic calculations shall be provided for approval showing the proposed layout of piping based on hydraulic calculations.
- D. A 10 psig cushion shall be hydraulically designed into each system.
- E. All sprinkler heads should be 165°F rated, with an orifice size of 1/2 inch. Sprinkler spacing shall not exceed a maximum spacing of 100 sq.ft. per head.
- F. An Inspector's Test Connection shall be provided at the hydraulically most remote part of the automatic sprinkler system.
- G. Flushing connections shall be provided at the most hydraulically remote ends of the crossmains. All branch lines on gridded sprinkler systems shall be arranged to facilitate flushing; this requires that one end of each branch line be detachable.

- H. The systems shall be designed in complete accordance with and as defined in NFPA and as required by the Department of Public Safety and the Fire Department. Systems shall be designed to provide for the minimum required water densities over the hydraulically most demanding rectangular areas.
- I. This Subcontractor has the option, where allowed, to provide for gridded systems. If provided, a pressure relief shall be provided.

3.18 FLOW TESTS

- A. This Subcontractor shall perform independent flow tests satisfactory to the Local Fire Department and the Owner, as a basis for hydraulically calculating the systems and verifying service sizes and for preparing the Fire Protection Working Drawings. The Subcontractor shall review the test data with the Design to settle on which data to use, prior to performing the final hydraulic calculations. The flow test results shall be forwarded to the Fire Department with the Fire Protection Working Drawings.
- B. Coordinate the timing of flow tests with the proper project timing.
- C. CAUTION: The water flow data provided herein is strictly for preliminary design services only and shall not be construed as final design data for the sizing of the systems.
- D. Flow test timing shall be coordinated with the Engineer's Designer and the Local Water Authority so as to occur prior to commencement of installation of interior distribution systems.
- E. All tests shall be done at times which are most representative of the usual demands which would be placed on the system; preferably at 9:00 a.m., Monday to Friday.
- F. Provide local paid advertisements of the flow tests, as required by the Local Water and sewer and coordinate with the Local Authority's requirements and timing of performing the tests. Obtain water maps and understand the water system in the area and the directions of flow. Ensure that no valves in the system are closed. Select the hydrants for testing which will provide for the best and most comprehensive results. Perform as many tests as are required to obtain accurate results which are representative of the system.

3.19 RUBBISH REMOVAL

- A. Remove from the site and legally dispose of all cartons of rubbish and debris resulting from work under this Section not less than once per week.

3.20 WET BUILDING SYSTEMS

- A. Furnish and install a complete wet sprinkler system to cover all areas of the building. The system shall commence where indicated on the drawings outside of the building wall, extending into and throughout the building to include all piping, backflow preventer, fire department pumper connection, cabinets, alarm bells, heads, flow switches, tamper switches, and any appurtenances and incidentals required to make a complete and operable system. Immediately inside the building, provide an OS&Y gate valve with tamper switch [no exceptions allowed].
- B. It is the intent of the Specification that the Subcontractor hydraulically design the systems and layout the piping the most effective way. All piping shall be run concealed where ceilings will be installed. Piping shall be integrated within the structure as structure is presently designed. This shall not relieve this Subcontractor from coordinating all exposed and concealed items.
- C. Install drain valves, vents and section valves where required for venting and draining systems and to facilitate repairs to any section of the systems without shutting down the entire system. All valves shall be provided with tamper switches.
- D. Piping shall be designed and laid out to allow flexibility in final head locations relative to other ceiling components and for future alterations. This requires a system of tees facing up with adequate swing elbows to allow for exact final positioning and height of heads.

3.21 BUILDING SYSTEM

- A. The building fire protection system shall begin as denoted herein and where indicated. .
- B. Isolation valves shall be installed in the “Main Loop” as indicated on the Drawings and as required by local authorities.
- C. All connections to equipment shall be provided with OS&Y valves, sized to handle the system for which they are serving.
- E. All normally open valves shall be provided with supervisory switches. In the portions of the system discussed above, this includes, but may not be limited to, the following:
 - 1. Main incoming service OS&Y valve;
 - 2. Sprinkler riser valves;
 - 3. Backflow preventer isolation valves;
- F. All components of the system described above shall be furnished and installed under this portion of the work.
- G. All equipment in the service entry or full line size of the line sizes noted on the plans.

3.22 SYSTEM IDENTIFICATION

- A. Provide color-coded pipe identification markers on all piping installed under this Section.

- B. Pipe markers shall be Snap-On laminated plastic equal to “Setmark” by Seton Name Plate Corp., Star Sprinkler Corp., W.H. Brady Co., or equal.
- C. Provide an arrow marker with each pipe service marker.
- D. Piping shall be labeled at 40-foot intervals.
- E. In general, 1 1/2 inch high legend shall be used for pipes 4 inch diameter and larger; 3/4 inch high legend shall be used for pipe lines 3 inch diameter and smaller. All identification shall be in accordance with NFPA and ANSI standards.
- F. Identify all drains and drain points, controls and similar equipment as to service with white lamacoid engraved nameplates with black letters. Permanently secure with self-tapping screws. Submit plate description for review.
- G. Provide typewritten master lists in Operating and Maintenance Instruction Manuals; and shop equipment numbers on Record Prints and sepias.
- H. Supply and install 1 1/2 inch diameter, 1/16 inch thick brass tags with 3/8 inch die stamped black letters. Attach to valves with four [4] inch brass chains.
- I. Prepare a small-scale fire protection system flow diagram of the piping systems to identify equipment control valves, drains, Inspector’s tests and valves. Include these diagrams in record drawings.
- J. Insert page-size copies of diagrams into each Operating and Maintenance Manual.
- K. Install a diagram, framed under glass, on the mechanical equipment room wall. Final location shall be directed by the Owner.

3.23 FINAL INSPECTION

- A. When the work under this Contract has been completed and is ready for final inspection, such an inspection shall be made by the Designer and the Owner’s representatives. At this time, the Fire Protection Subcontractor shall demonstrate that the requirements of these Specifications and the Drawings have been met to the satisfaction of the Designer, Owner and the Local Fire Department.

3.24 RECORD DRAWINGS

- A. The awarded Fire sprinkler contractor shall keep a set of his approved working drawings at the General Contractors trailer/office at all times. Where sprinkler installation has varied from the working drawings, the sprinkler contractor shall “RED PENCIL” those changes on the set of working drawings left in the General Contractors trailer/office. Upon completion of his work, the sprinkler contractor shall transfer the “RED PENCIL” changes on to his AUTOCAD working drawings and submit to Architect/owner as “RECORD DRAWINGS”, with the appropriate completion date. This shall be a pre-requisite before final payment.

END OF SECTION

SECTION 22 00 00

PLUMBING FILED SUB-BID

PART 1 GENERAL

SUMMARY

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this section shall include all plumbing construction for the Project, including all accessories identified within the specification sections referenced below, and necessary to provide a complete installation.
- B. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - 1. Section 22 10 00: PLUMBING.
- C. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above

listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.

- D. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- E. Waste Removal/Dumpster: This subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Temporary Weather Protection: The General Contractor shall provide tenting and heat to the work area, including to scaffolding provided by this section, during the months of November through March. This subcontractor shall remain responsible, without exception, for providing heat to masonry materials including unit masonry, sand, water, and other components to assure proper temperatures are maintained prior to installation
- G. Cutting and Patching: This Filed Sub-Bid Subcontractor shall be perform all cutting, coring, and/or patching required to complete the work of this section, except as specifically indicated in respective sections listed as part of the work of this Filed Sub-Bid. Where any of these sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching necessary for the work of this section shall be borne by this Subcontractor. All cutting, coring, and patching shall be coordinated through and by the General Contractor. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- H. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements all sections of the work.

Primary Drawings listed are those intended to indicate the Scope of Work for this trade.

- 1. T-1.1,A-1.1, A-1.1 ALT, A-1.2, A-1.3, A-3.6, , A-3.6A, A-3.7, A-3.8,A-3.10, A-3.12, P-1.1, P-1.2, P-1.3,E-1.1,E-1.2,E-1.3,E-1.4,FP-1.1,FP-1.2,FP-1.3, FP-1.4, M-1.3, M-1.4
- l. In addition to the above listed "Primary Drawings" that define the scope of this section, this subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 **RELATED REQUIREMENTS**

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 22 00 - Unit Prices: Descriptions of unit price items, administrative requirements.
- D. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- E. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- F. Section 01 50 00 - Temporary Facilities and Controls.
- G. Section 01 57 21 - Indoor Air Quality Controls:
- H. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 **REFERENCE STANDARDS**

- A. Refer to individual specification Sections listed above for Reference Standards.

1.06 **SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to each individual Specification Section listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 **QUALITY ASSURANCE**

- A. Refer to each individual Specification Section listed above for additional requirements.

1.08 **WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Refer to each individual specification section listed above for specific warranties required.

PART 2 PRODUCTS (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR PRODUCT REQUIREMENTS)

PART 3 EXECUTION (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR EXECUTION REQUIREMENTS)

3.01 **CLEANING**

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 22-10-00 – PLUMBING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. A complete domestic cold water system throughout the building. The system shall originate at a connection to the new water main at 10'-0" from foundation wall and extend to every fixture, piece of equipment or outlet requiring cold water.
 - 2. A complete sanitary, waste and vent system throughout the entire building connecting to each and every fixture and piece of equipment requiring sanitary drainage. This system shall extend and connect to the new sanitary main 10'-0" outside of the building. Vents shall extend through the roof.
 - 3. A complete domestic hot water system throughout the building. The domestic hot water system shall originate from the new 50 gallon electric domestic water heater and extend to every fixture, piece of equipment or outlet requiring domestic hot water. The domestic hot water system shall utilize a domestic hot water return system.
 - 4. A complete natural gas system throughout the building connecting to the HVAC equipment. The systems shall extend and connect to the house side of the new gas meter provided by the Gas Utility Company. Make all necessary arrangements and pay all costs for the new exterior gas service and meter for this project.
 - 5. Pipe insulation.
 - 6. All pipe hangers, clamps, rods, supports, sleeves, inserts, escutcheons and access panels.
 - 7. wall hydrants (provide at 150 ft. on center around perimeter of building)

9. Cleaning, testing and disinfection.
 10. All supplementary steel for piping and equipment.
 11. Guarantees
 12. Operating and Maintenance Manuals
 13. Thrust blocks and related supports and restraints.
 14. Final connections to all utility lines.
 15. Testing of all plumbing systems required.
 16. Backcharges from all utility companies. [gas service and gas meter]
 17. Record Drawings.
 18. Coordination Drawings.
 19. Valve Tags and charts
 20. All equipment and installations required by local ordinances not covered on drawings and specifications
- B. Items to be Furnished Only: Furnish following items for installation under designated .
1. SECTION 08 31 00 - ACCESS DOORS
 - a. Access doors to be installed under applicable sections.
- C. Items to be Installed only: Install the following items as furnished by the designated Sections: NONE
- D. Related Work: The following items are not included in this section and will be performed under the designated sections and as indicated below:
1. SECTION 01 31 14 – PROJECT COORDINATION
 - a. Coring, cutting and patching.
 2. SECTION 01 50 00 – TEMPORARY FACILITIES
 - a. Temporary heat, light, water, power and sanitary facilities for use during construction and testing.

3. SECTION 03300 – CAST-IN-PLACE CONCRETE
 - a. Pads, concrete bases and form work.
4. SECTION 06100 - ROUGH CARPENTRY
 - a. Wood blocking and grounds
5. SECTION 07 84 00 - FIRE STOPPING
 - a. All firestopping where required around fire protection pipes.
6. SECTION 09 90 00 - PAINTING
 - a. Painting of all exposed plumbing equipment not having enameled surfaces, stainless steel or chromed finishes.
7. SECTION 21 00 00 - FIRE PROTECTION
 - a. Fire service piping
 - b. Sprinkler drains
8. SECTION 24 00 00 - HEATING, VENTILATING AND AIR CONDITIONING
Extension of city water piping and fittings including insulation, connecting to HVAC equipment.
9. SECTION 031 00 00 - EARTHWORK
 - a.
 - a. Excavation and backfilling for all underground piping and structures.
10. SECTION 33 11 14 – CONNECTION TO EXISTING UTILITIES
 - a. Utilities [such as sanitary, storm, gas and water] beyond point indicated on the drawings from the building walls.
 - b. Site drainage
 - c. Utility Structures

11. SECTION 26 00 00 - ELECTRICAL

- a. All power wiring of every description to be provided under 16100 Electrical. All starters and controllers for mechanical equipment, except where provided as integral with mechanical equipment, shall be provided under SECTION 16100 Electrical.

1.3 INTENT

- A. All work shown on the Drawings is intended to be approximately correct to scale, but figured dimensions and detailed Drawings are to be followed in every case. The Drawings shall be taken in a sense as diagrammatic. Size of pipes or conduits 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.
- B. 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.
- C. Locations shown on the Drawings are approximate and it is intended that all equipment shall be located in accordance with the general and detail Drawings of the construction proper. All measurements shall be taken at the building before fabrication commences.

1.4 QUALITY ASSURANCE

- A. The work shall be executed in strict conformity with the latest edition of the prevailing State Plumbing and Building Codes and all local regulations that may apply. In case of conflict between the contract documents and a governing code or ordinance, the more stringent standard shall apply.
- B. Unless otherwise specified or indicated, materials and workmanship shall conform with the latest edition of the following Standards and Specifications:

American National Standards Institute (ANSI)
Underwriter's Laboratories, Inc. (UL)
American Society for Testing and Materials (ASTM)
National Fire Protection Association (NFPA)
American Gas Association (AGA)
National Electric Code (NEC)
Department of Environmental Protection (DEP)
International Plumbing Code

- C. If any work is performed and subsequent changes are necessary to conform to the

ordinances, the changes shall be made at the Plumbing Subcontractor's expense.

- D. All new plumbing equipment shall be designed to conform to applicable state and local energy codes. Pipe insulation, domestic water heater, and flow control fittings shall be selected with efficiencies and design conditions to meet applicable energy codes.
- E. Availability of a "Certificate of Approval" from the local and/or state Plumbing Inspector shall be a prerequisite to scheduling a final inspection to this contract. A copy of the certificate shall be submitted to the Designer.
- F. Workmanship shall be of the best quality and none but competent workmen skilled in their trades shall be employed. The Plumbing Subcontractor shall furnish the services of an experienced superintendent, who will be constantly in charge of the erection of the work, until completed and accepted.
- G. Obtain from the manufacturer the proper method of installation and connection of the equipment that is to be furnished and installed. Obtain all information that is necessary to facilitate the work and to complete the project.

1.5 COOPERATION AND COORDINATION WITH OTHER TRADES

- A. It shall be the responsibility of the Plumbing Subcontractor to fully coordinate his work with that of the other trades so that all work may be installed in the most direct and workmanlike manner and so that interference between piping, ducts, conduits, equipment, architectural and structural features and other work will be avoided.
- B. This Subcontractor shall obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same. He shall also obtain all information from the General Contractor which may be necessary to facilitate his work and the completion of the whole project.
- C. It shall be the responsibility of the Plumbing Subcontractor to consult with and provide the General Contractor with the exact location and size of all openings, and full information of the required work at the proper time and it will be the duty of the General Contractor to provide the same.
- D. The Plumbing Subcontractor shall be responsible for the proper location of his required sleeves, chases, inserts, etc., and see that they are set or cut into the concrete.
- E. In case the work of the two trades interferes in such a manner as to necessitate a deviation from the design, this work shall not proceed in this area until the Designer has been notified and has rendered a decision as to the manner in which the difficulty shall be overcome.

1.6 RECORD DRAWINGS

- A. Provide a set of red line mark-up drawings on site at all times during construction for all changes made from contract drawings. Incorporate all changes on CAD at end of project to be used as as-

built drawings.

B. Refer to Section 01700 - CONTRACT CLOSE-OUT

1.7 PERMITS, FEES, RULES AND REGULATIONS

A. 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 and the Public Utilities Companies serving the building.

1.8 PROTECTION OF WORK AND PROPERTY

A. Be responsible for the care and protection of all work included under this Section until it has been tested and accepted.

B. Protect all equipment and materials from damage from all causes including theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no 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 and make good any damage thus caused.

1.9 SUBMITTAL REQUIREMENTS

A. Refer to Section 01300 - SUBMITTALS

B. Submit the following shop drawings for approval:

1. Valves, hangers, supports
2. cleanouts and access doors
3. Sanitary, hot water, hot water recirculation & Cold water pipe insulation
4. Sanitary, waste, vent, cold water, hot water, hot water recirculation & gas piping material
5. Pipe identification markers, stickers and tags
6. Wall hydrants
7. Seismic bracing (if required)
8. Plumbing Fixtures and there accessories
9. Elevator sump ejector
10. Insulation (domestic water and sanitary or waste piping where called for)

1.10 MATERIAL AND EQUIPMENT STANDARDS

A. Where materials or equipment are specified by patent proprietary name, or name of the manufacturer, such Specification shall be deemed to be used for the purpose of establishing a standard for that particular item. 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 and only if the term “equal” appears.

1.11 GUARANTEE

- A. Refer to Section 01700 - CONTRACT CLOSE-OUT

1.12 CERTIFICATES OF APPROVAL

- A. Refer to Section 01700 - CONTRACT CLOSE-OUT
- B. Furnish any certificates necessary as evidence that the work conforms to the requirements of all authorities having jurisdiction.

1.13 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

- A. Refer to Section 01700 - CONTRACT CLOSE-OUT
- B. Each manual shall contain the following information:
 - 1. Description of each system, with description of each major component of the system.
 - 2. Complete sets of page-size fixture and equipment show drawings including any control drawings.
 - 3. A lubricating schedule of all specified equipment.
 - 4. Exploded views of equipment showing names of parts and parts numbers.
 - 5. Fixture and equipment identification list with serial numbers.
 - 6. Page-size valve tag schedule and flow diagrams.
 - 7. Final water balancing report of fixtures and equipment.
 - 8. Water treatment procedure and tests.
 - 9. Names, addresses and phone numbers of all suppliers and service personnel for all equipment.
 - 10. Copies of all product equipment and system guarantees from manufacturers, including signed written guarantee of system from this Subcontractor.

1.14 CLEANING AND ADJUSTING

- A. At the completion of the work, all fixtures, equipment, apparatus and exposed trim included in this Section, shall be cleaned and left ready for use. Equipment or fixtures which have been damaged during construction shall be replaced with new at no cost to the

Owner.

1.15 DEBRIS

- A. The Plumbing Subcontractor shall be responsible for the removal of all debris caused by his work and his workmen. Such debris shall be removed daily in order to leave all areas in a clean and safe condition.

1.16 TEMPORARY WATER

- A. Refer to Section 01500 - TEMPORARY FACILITIES.

1.17 WATERPROOFING AND COUNTERFLASHING

- A. The Plumbing Subcontractor shall provide all counterflashing for all piping as applicable and as provided by him, which pierce roofs, walls and other weather barrier surfaces.
- B. Pipes passing through slabs shall have the sleeve extended above floors as hereinafter specified to retain any water and the space between the pipe and sleeve caulked with lead wool. The top shall be sealed with lead and the bottom shall be sealed with monolastic caulking compound.

1.18 CONNECTIONS TO EQUIPMENT

- A. The Plumbing Subcontractor shall provide all pipe connections, as applicable, to equipment provided under other Sections of the Specifications as shown on the contract drawings and herein specified including final connections to equipment to result in a complete system, fully operational. Coordinate location of all equipment with the General Contractor and Designer. Obtain installation diagrams and methods of installation of all equipment, from manufacturers. Follow instructions strictly. If additional information is required, obtain same from the Designer.

1.19 STANDARD OF MATERIALS AND WORKMANSHIP

- A. Refer to Division 1 for general instructions and, in addition, adhere to the following:
 - 1. Workmanship and installation methods shall conform to the best standard practice. Work shall be performed by skilled tradesmen under the direct supervision of fully qualified personnel.
 - 2. Install equipment in strict accordance with manufacturer's written recommendations.
 - 3. When requested, submit samples of materials proposed for review before proceeding with the work.
 - 4. Install equipment and materials to present a neat appearance. Run piping parallel with or perpendicular to building planes.

5. Conceal piping in finished areas. Install work so as to require a minimum amount of furring.
6. Make provisions for neat insulation finish around equipment and materials.
7. Equipment, materials and work shall comply with the requirements of generally recognized agencies, and shall conform to and be installed in strict accordance with Federal, state and City or Town requirements and shall meet all of the requirements of all authorities having jurisdiction.

1.20 ABBREVIATIONS AND DEFINITIONS

- A. "This Subcontractor", "The Contractor" and "P.C." mean specifically the Plumbing Subcontractor working under this respective of the Specifications.
- B. "Equipment" as mentioned and intended herein shall mean any and all plumbing fixtures and equipment.
- C. The terms "storm drainage" and "rainwater drainage" are synonymous and are used interchangeably.
- D. "Provide" may be used in place of "furnish and install" and where used shall mean to deliver, furnish, erect, and connect up complete in readiness for regular operation, the particular work and equipment referred to, unless otherwise specified.
- E. "Concealed" shall be defined as areas where piping is located in chases, shafts, and furred ceilings.
- F. All other piping shall be considered "exposed".
- G. "Exposed" shall mean within sight in closets, in finished rooms, under counters, behind and/or under equipment and/or otherwise visible.
- H. "Underground" shall mean pipe, conduit or equipment that is buried exterior to or within the building.
- I. "Finish grade" as used herein means the final grade elevations indicated on the Drawings.
- J. "Piping" shall mean and include pipe, fittings, hangers and valves.
- K. "Tempered water" shall be considered the same as hot water throughout the Specification.
- L. "Date of acceptance", as it is used in reference to the guarantee, shall mean that date upon which the system or equipment is turned over and accepted by the Owner complete with initial start-up and the Owner's instruction period.

1.21 DRAWINGS

- A. The Drawings are intended to show approximate locations of apparatus, fixtures and piping in diagrammatic form. The Drawings are not intended to show Architectural and Structural details.
- B. Do not scale drawings. Obtain any information requiring accurate dimensions from Architectural and Structural Drawings and from site measurements. Check locations and elevations before proceeding with work.
- C. At no additional cost to the Owner, make all changes and additions to provide materials and/or equipment necessary to accommodate structural and architectural conditions.
- D. Leave areas clean where space is indicated as reserved for future equipment.
- E. Whether shown on the Drawings or not, leave adequate space and provision for servicing of equipment and removal and reinstallation of replaceable items such as motors, coils, and tubes.
- F. Where “roughing-in” only for equipment, which is not part of this Section, obtain accurate information before proceeding with the work.
- G. Provide all ceiling mounted components, including access doors and panels, in strict accordance with reflected ceiling plans.
- H. Refer to Architectural Drawings for fire ratings of walls and slabs. The intent is this Subcontractor shall be fully responsible for sealing all penetrations to maintain the required fire ratings.

1.22 CROSS AND INTERCONNECTIONS.

- A. No plumbing fixtures, equipment, connection, device or pipe shall be installed which would provide a cross or interconnection between a distributing supply and a drainage system or a soil or waste pipe, which would permit or make possible the backflow of sewage, polluted water, pollutants or waste into the domestic water supply system, unless such connections are protected with approved cross connection devices.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Type A:

Type K soft annealed copper tubing one piece with no joints as manufactured by Bridgeport Brass, American Brass, Revere Copper or equal between the connection to the exterior water supply and the first fitting within the building. Fittings shall be wrought copper joined with a silver brazing filler.

C. Type B:

Type L hard drawn copper tubing with wrought copper sweat fittings joined as manufactured by Bridgeport Brass, American Brass, Revere Copper or equal with approved 95/5 lead free tin antimony solder.

F. Type C:

Service weight bell and spigot cast iron soil pipe and fittings joined with oil free Okum and lead.

H. Pipe and fittings shall be in accordance with the following:

- | | |
|---|----------|
| 1. Exterior Water Service | Type A |
| 2. Cold Water, Hot Water & Hot Water Recirculation Piping | Type B |
| 3. Sanitary, waste & vent from last building
clean out to 10' beyond foundation wall | Type C |
| 4. Gas Piping | See 2.14 |

2.2 INSULATION

A. Pipe insulation shall be similar to Owens Corning, John Manville, Certain-teed, Armstrong or equal.

1. Type A: Owens Corning Fiberglass ASJ/SSL-II heavy density resin-bonded inorganic glass, all service gasket, Kraft reinforced fill vapor retarder jacket with two factory-applied pressure sensitive adhesives for positive closure and vapor sealing. Turn all laps away from normal view. Circumferential joints shall be sealed with self-sealing butt strips. Valves and fittings shall be insulated with Zeston Hi-Lo temperature insulation of thickness equal to adjacent piping and covered with Zeston 2000 PVC fitting covers, 25/50 rated with approved vapor retarder mastic compatible with the PVC applied around the edges of the adjoining pipe insulation and on the fitting cover throat overlap seam. Secure with pressure sensitive PVC; Z tape along the circumferential edges. Extend tape over adjacent insulation with overlap on itself of at least 2 inches.

2. Type B: Owens Corning fiberglass ASJ heavy duty resin bonded inorganic glass, all service jacket with longitudinal laps sealed with staples. Turn all laps away from normal view. Circumferential joints shall be sealed with self-sealing butt strips. Valves and fittings shall be insulated with Zeston Hi-Lo temperature insulation of thickness equal to adjacent piping and covered with Zeston 2000 PVC fitting covers, 25/50 rated, secured in place with tacking and finished with pressure sensitive PVC Z tape along the circumferential edges. Extend tape over adjacent insulation with overlap on itself of at least 2 inches. All tacks and staples shall be finished with white finish.

4. Insulation shall be in accordance with the following schedule:

Service	Insulation Thickness	Type
Sanitary piping (where directed)	½"	1
Cold & Hot Water Piping	½"	2

2.3 PIPE SLEEVES, HANGERS AND FIXTURE SUPPORTS

- A. Pipe sleeves, pipe hangers, pipe anchors, auxiliary steel, wood blocking and fixture supports shall be furnished and set by this Subcontractor, and he shall be responsible for their proper and permanent location. This Subcontractor shall be responsible for all core drilling.

- B. Pipe sleeves shall be installed and properly secured at all points where pipes pass through concrete or wood. Pipe sleeves shall be of sufficient diameter to provide approximately ¼ inch clearance around insulation. Pipe sleeves through partitions and floors shall be Schedule 40 galvanized pipe. Wall sleeves shall have chromium-plated escutcheons with setscrews or clips for firmly holding in place. Sleeves in floor shall extend one inch above the floor and after installation of piping shall be packed and made watertight. 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 a material which will maintain the integrity of the fire rating. Refer to Section 07250.

- D. All piping shall be rigidly supported from the building structure by means of approved hangers and supports. This Subcontractor 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 five-foot intervals except where ten-foot lengths of piping are used, then ten-foot intervals are acceptable. Copper tubing 1 ½ inch and larger shall be supported at ten-foot intervals. Copper tubing 1 ¼ inch and smaller shall be supported at six foot intervals.

- F. Vertical cast iron piping shall be supported at base, at each story height and at ten-foot intervals. Vertical copper tubing shall be supported at each story height and at not more than ten-foot intervals.
- G. Hangers for piping sizes four inches and smaller shall be Carpenter-Patterson, No. 1A band type, Grinnell Company, Calco Steel Products Company or equal, black steel with hanger rods with machine threads; for un-insulated copper tubing, the hangers shall be copper plated. Hangers for piping larger than four inches shall be the adjustable clevis hanger type, malleable iron with extension rod. Chain, strap, perforated bar or wire hangers will not be approved. Approved gang hangers may be used in lieu of separated hangers on pipes running parallel to each other and close together. Where used for un-insulated copper tubing, all hangers shall be copper plated. This Subcontractor shall furnish and install the steel insulation shields at each hanger location on piping to be insulated. 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. Where chair carriers are required, they shall be completely concealed in the building construction and shall rigidly support the fixture from the floor. Chair carriers shall be adjustable both vertically and horizontally and shall support fixtures in such a manner that no part of the fixtures shall be supported by the wall or partition. Chair carriers shall be furnished complete with necessary bolts, nuts and washers as well as connecting nipples of the proper length with gaskets for the fixture connection. Any movement of fixtures is unacceptable. Chair carriers for water closets and urinals shall include flushometer supply pipe support. Chair carriers shall be as manufactured by Josam, J.R. Smith, Zurn or equal.
- J. Wherever wood blocking is required to insure adequate support of fixtures and related piping, it shall be provided by this Subcontractor.
- K. Whenever new penetrations to a previously poured slab are required for the installation of floor drains, shower drains, mop receptors, flush floor cleanouts or similar items of plumbing, these penetrations shall be totally sealed with a fire and water stop sealant. Sealant shall be Dow Corning fire stop sealant, Catalog No. 2000, 3M, GE Silicones, or equal. Hourly fire rating in hours must meet the requirements of the slab being penetrated.

2.4 CLEANOUTS

- A. Cleanouts shall be as manufactured by Josam Manufacturing Company, J.R. Smith Manufacturing Company, Zurn Industries, Incorporated or equal.
- B. Cleanouts shall be iron body with heavy brass plug and raised nut, same size as pipe for piping up to four inches for piping larger than four inches in size and closed gas tight. Floor cleanouts in carpeted areas shall have carpet clean out markets. Floor cleanouts shall not be located beneath partitions.
- C. All cleanout types shall be Josam, J.R. Smith, Zurn or equal. End cleanouts on no hub cast iron shall be Josam Series 58900-20. End cleanouts on copper waste shall be Nibco 816. Flush floor cleanouts shall be Josam Series 56000-2-22-41 in concrete floors. Exposed Dandy cleanouts on no hub cast iron shall be Josam Series 58910-20. Wall cleanouts and concealed Dandy cleanouts on no hub cast iron shall be Josam Series 58910-19 with Series 58890 clean out plug with center screw length as required.

2.5 VALVES

- A. Each valve type shall be the product of a single manufacturer. Each system shall be provided with valves as required by code and as shown on the drawings. Valves shall be installed to facilitate operation, replacement and repair. Provide access panels where valves are concealed behind non-removable ceilings or walls. Provide shut off for supply piping to individual pieces of equipment. All valves to be Apollo, Jenkins, Watts or equal.
- B. All shut off valves on cold water and hot water piping two inches and smaller shall be Apollo Series 77-200, solder end, bronze body ball valve, chrome plated bronze ball, 600 psi WOG full port ball valve.
- G. Fuel Gas Cocks
 - 1. Gas cocks 2 ½" and larger shall be all iron, lubricated plug, flanged ends, 125 psi working pressure:

Crane 325, Rockwell 143 or Walworth 1797F.
 - 2. Gas cocks 2" and smaller shall be bronze, lubricated plug, screwed ends, 125 psi working pressure:

Crane 254, Hays 7005 pr. Mueller H-11003.
 - 3. Provide one wrench for each gas cock size.

- H. Vacuum breakers shall be bronze 200 PSIG, 250°F, ½" male threaded. Watts No. 36A, Febco, Amtrol or equal.
- I. Thermometers for hot water piping shall be dial type, 5" dial size, ½" union connection, stainless steel case and stainless steel thermometer well, range 0-200°F. Ashcroft NU 50-6042 EHT with 3956 well, Amtrol, Zurn or equal.

2.6 FLOOR DRAINS

- A. Zurn Z-415-1022 trap primer

2.7 WALL HYDRANTS

- A. Wall hydrants shall be Josam, Chicago, Zurn or equal.
- B. Josam Model No. 71050-72-73 series cast bronze non-freeze wall hydrant with satin finish nikaloy face, ¾ inch HPT outlet, integral vacuum breaker back- flow preventer, pressure relief valve, bronze casing, bronze operating parts convertible into service tool, ¾ inlet connection. To be located 150 ft. on center at exterior of building.

2.8 PLUMBING FIXTURES

P1H Water Closet – Tank Type – Floor Mounted
 TOTO "DARTMOUTH" CST75SF 1.6 gpf, 12" elongated with side handle
 Floor Outlet, Vitreous China, Colored white
 SS114 Softclose seat and lid
 Shall meet requirements of ADA and Massachusetts Barrier Board

P2H Wall Hung Mounted Lavatory (Handicap)
 Toto Model Number LT307.4, vitreous china, color white.
 Moen model #6150, lever style handles, metal construction
 gpm max, chrome finish
 Provide, supply, stops, tailpiece, trap and pop-up strainer
 Shall meet requirements of ADA and Massachusetts Barrier Board

P3 Water Cooler Oasis PG8ACSL-SS Bi Level ADA Compliant

P4 Mop Receptor
 Fiat Model MSB 2424 Molded Stone Basin with
 Model 830-AA Service Faucet, 832-AA Hose & Hose Bracket,
 889-CC mop bracket & MSG 2424 wall guard

Elevator Sump Pump
 Stancore oil-minder control system model SE-50 with float & oil-minder
 probe

Electric Water Heater
 Bradford White Optimizer Model M-III 50T6DS, 6KW, 208 V,

2.9 ANCHORS, EXPANSION JOINTS AND OFFSETS

- A. Make proper provisions for expansion and contraction in all parts of the hot water and hot water re-circulation piping systems wherever possible by means of pipe bends, pipe offsets, swing connection or changes in direction of piping.

2.10 WATER METER

- A. Provide and install a new water meter. The Type and size shall be approved by water department

2.11 PIPE IDENTIFICATION

- A. All piping, except that piping which is within inaccessible chases, shall be identified with semi-rigid plastic identification markers equal to Setmark Pipe Markers. The Sani-Tech Group, Seton Name Plate Co. or equal. Direction of flow arrows are to be included on each marker. Each marker background shall be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ANSI A13.1-1981). Setmark Type SNA markers shall be used above five 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 pipe passage through wall, at each pipe passage through floors, at each pipe passage to underground and on all vertical and horizontal piping at 20 foot intervals maximum. All non-potable water lines and outlets shall be identified in accordance with the requirements of The Massachusetts 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 ½ inch diameter with stamped black filled letters, similar to Seton S type 250-BL or equal. Lettering shall be ¼ inch high for type service and ½ inch for valve number. Tag shall be attached to valves with approved meter seals with four ply .018 copper smooth wire or approved brass "S" hooks, or brass jack chain. 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 Plexiglas. 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 valve 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 when one valve is to be opened or closed. Printed frame valve lists shall be displayed in each Mechanical Room or in a location designated by the Owner.
- D. Equipment nameplates shall be ¾ inch by 2 ½ 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.

2.12 TESTS AND APPROVALS

- A. Pipe lines shall be blown or flushed clean, before piping tests are applied. All plumbing work shall be tested as herein specified. No portion shall be covered, concealed, used or made inaccessible to testing, inspection, repair, correction or replacement until tests thereof have been satisfactorily completed in the presence of the Designer's Authorized Representatives. The Plumbing Subcontractor must accommodate his testing operations to the progress of the project as a whole. Correct all defects appearing under test and repeat until all parts of the work have withstood them successfully.
- B. Furnish all labor, material and services for testing, including testing plugs, pumps and compressors; he shall make and remove all temporary piping connections required for the tests and shall dispose of test water and all wastes after tests. Leave all work in good order, ready for full use.
- C. Tests on all plumbing systems shall be made in accordance with the requirements of the Local Plumbing Code.

2.13 WATER HAMMER ARRESTORS

- A. Not Applicable

2.14 NATURAL GAS PIPING SYSTEM

- A. Gas piping shall be Schedule 40 black steel pipe with threaded ends and 150 pound black malleable iron flat band threaded fittings.

- B. The gas distribution system installation shall include all pipe, fittings, valves and all accessories and incidentals to conform with the code requirements. Piping shall be installed with an 8" long sediment leg at the base of all drops and shall be arranged with drain valves at low points. All changes in directions shall be made with plugged tees for cleaning piping out. See drawing for pipe supports on roof.
- C. The Plumbing Subcontractor shall make all final connections between each piece of equipment requiring gas and the gas distribution systems.
- D. The Plumbing Subcontractor shall obtain all permits for the installation of the interior gas distribution systems. Local Gas Company back charges and fees shall be paid by the Plumbing Subcontractor.

2.15 CLEANOUTS

- A. Floor cleanouts shall have cast iron body and frame, extra heavy duty round adjustable scoriated nickel bronze top, taper thread bronze plug and inside caulk outlet. Smith 4108, Josam, Zurn or equal.

2.16 ACCESS PANELS

- A. Refer to Section 08 31 00 – ACCESS DOORS.

PART 3 – EXECUTION

3.1 GENERAL

- A. Provide materials and equipment as shown and specified or as required to provide complete and satisfactory operating systems, omitting only those items specifically excluded. Make connections to equipment, devices, etc., provided or installed under this Section as shown and specified.
- B. All equipment, outlets and devices shown on the Plumbing and Architectural Drawings shall be connected with all of the proper utilities and properly tied into the building plumbing systems.

3.2 MATERIALS AND WORKMANSHIP

- A. Work shall be executed in a workmanlike manner and shall present neat and mechanical appearance when completed. Piping shall run concealed except in mechanical rooms and areas where no ceiling exists.
- B. Work and workmen shall be fully insured as required.
- C. Material and equipment shall be furnished new.
- D. The Owner shall not be responsible for material and equipment prior to testing and acceptance.

3.3 BULLETINS, MANUALS AND INSTRUCTIONS

- A. Furnish operation, lubrication and maintenance manuals for each piece of equipment.

3.4 INSTALLATION OF EQUIPMENT

- A. Equipment shall be installed to avoid interference with structure and with work of other trades.
- B. Equipment shall be installed so as to properly distribute equipment loads.
- C. All steel supports and hardware for proper installation of anchors, guides and hangers shall be provided.

3.5 EXPANSION

- A. All piping shall be installed to allow for expansion using offsets, loops or expansion joints.
- B. Provide alignment guides and anchors as required.
- C. Install piping to allow freedom of movement in all planes without imposing undue stress on any section of the main piping, branch piping, equipment and structure.
- D. Install expansion joints in accordance with manufacturer's published installation instructions.

3.6 PIPE GUIDES AND ANCHORS

- A. Provide pipe guides for expansion joints according to expansion joint manufacturer's published recommendations. Use at least two guides each side of expansion joint or loops.
- B. Install manufacturer or field fabricated alignment guides to allow movement in axial direction only. Install vertical risers properly anchored and guided to maintain accurate vertical position of piping. At time of start-up, clean and lubricate guides and adjust to allow free sliding at operating conditions.
- C. Fabricate anchors from structural steel channels, plates or angles secured to the structure.
- D. Take care to avoid introduction of excessive reactive forces and operating weights into the structure and onto equipment and piping.
- E. Prepare and submit for review, prior to installation, drawings showing the location of expansion joints and anchors. Show details of proposed connection to structure.

3.7 INSERTS

- A. Properly locate and firmly secure inserts to form before concrete is poured, for new construction.
- B. For support of light equipment and materials, approved self-drilling expansion shields may be used.

- C. Where inserts must be placed after concrete has been poured, use self-drilling expansion shield inserts as approved by the Structural Engineer.
- D. Place inserts only within main structure and not in any finishing materials.
- E. When inserts are required in precast concrete, supply inserts and location drawings to the precast concrete supplier for casting into the material. Otherwise, include the cost of having the precast concrete supplier install inserts at the site.
- F. Use wedge type concrete inserts, similar to Grinnell Fig. 281, for pipe and equipment hangers, supports and anchors, adequately sized for loads to be carried. Fee and Mason, Patterson and Carpenter or equal.
- G. The use of “explosive” type inserts shall be prohibited.

3.8 HANGERS

- A. Suspend piping and equipment with all necessary hangers and supports required for a safe and workmanlike installation. Ensure that pipes are free to expand and contract and are graded properly and that each hanger is adjusted to take its full share of the weight.
- B. Suspend hanger rods directly from the structure. Do not suspend from pipes, ducts, equipment, metal work, ceilings or hangers of other trades.
- C. Supply and install auxiliary structural steel angles, channels and beams where piping and equipment must be suspended between joists or beams.
- D. Hangers shall be spaced to ensure that structural steel members are not overstressed. In no case shall pipe hangers be further apart than indicated in this Specification.
- E. The use of trapeze-type hangers for support of piping shall be subject to prior acceptance. Where permitted, fabricate from angle or channel frames and space hangers to suit the smallest pipe size.
- F. Do not use hooks, chains or straps to support equipment and materials.
- G. All hangers shall be suspended directly from slabs, beams and the top chord of joists. Hangers shall not be suspended from the bottom chord of joists.
- H. Copper piping shall utilize copper plated supports or copper plated rockers sized for insulation thickness to hanger ring on underside [to prevent electrolysis].

3.9 PIPE IDENTIFICATION

- A. Provide color-coded pipe identification markers on all piping installed under this Section.

- B. Pipe markers shall be snap-on laminated plastic equal to “Setmark” by Seton Name Plate Corp. Star Sprinkler Corp., W.H. Brady or equal.
- C. Provide an arrow marker with each pipe service marker.
- D. Piping shall be labeled at twenty feet intervals and at the entrance and exit of all mechanical areas.
- E. In general, one and one-half inch high legend shall be used for pipes four inch diameter and larger; ¾ inch high legend shall be used for pipe lines three inch diameter and smaller.
- F. Color coding shall be in accordance with industry standards and with ANSI A13.1, latest edition.
- G. Locate identification and flow arrows as follows:
 - 1. On vertical pipes approximately seven feet above floor.
 - 2. At each change of direction of piping.
 - 3. At intervals not greater than 40 feet on straight runs of exposed piping and on both sides of walls.
- H. Provide typewritten master lists in Operating and Maintenance Instruction Manuals; and shop equipment numbers on Record Prints and Sepias.

3.10 VALVE TAGS AND CHART

- A. At the completion of work, attach to each valve on the hot and cold water system, a valve tag of at least 1 ½ inch in diameter with designating numbers corresponding to a chart for identification purposes.

3.11 ACCESS AND ACCESS PANELS

- A. Provide proper access to all valves, traps, strainers, controls and material and equipment which may need inspection, replacement or service. Coordinate locations with the General Contractor.
- B. Where shut-off valves or other items requiring access occur, furnish access panels for installation under other sections.

3.12 ESCUTCHEONS

- A. Escutcheons shall be installed around exposed pipe passing through finished floors, walls and ceilings. Escutcheons shall be heavy, cast brass, chromium plated and adjustable to

fit snugly around pipe, with set screw.

3.13 SLEEVES

- A. Provide sleeves for all services except soil, waste, vent and rainwater.
- B. Set sleeves for piping in conjunction with erection of floors and walls, for new construction. Locate sleeves accurately and in accordance with Shop Drawings.
- C. Size sleeves to provide one inch clearance around piping and to allow continuous runs of insulation where specified. Ensure that piping does not touch sleeves.
- D. Piping sleeves shall be according to the following:
 - 1. Through interior walls, use 18 gauge rolled and tack welded galvanized steel sleeves, set flush with finished surfaces on both sides. Refer to Room Finish Schedule.
 - 2. Through exterior walls above grade and roofs, use machine cut and reamed standard weight steel piping, set flush with finished surfaces on inside and to suite flashing on outside.
 - 3. For floors in mechanical equipment rooms, and similar areas where a water dam is required, use machine cut and reamed standard weight steel piping set flush to underside of structure and extending two inches above finished floor.
 - 4. For other floors, use 18 gauge rolled and tack welded galvanized steel, or machine cut and reamed plastic pipe or standard weight steel piping set flush to both finished surfaces. Refer to Architectural Room Finish Schedule. Exception: In areas with a sprinkler system, sleeves shall extend one and one-half inches above floor.
 - 5. Refer to drawing details for sleeving through below grade walls.
 - 6. Cover pipe sleeves in walls and ceilings of finished areas other than equipment rooms with satin finish stainless steel, or satin finish chrome or nickel plated brass escutcheons, with non-ferrous set screws. Do not use stamped steel split plates. Split cast plates with screw locks may be used.
- E. Prepare and submit detailed drawings showing accurate size and spacing of sleeves. Submit for review at least four weeks before installation.

3.14 FLASHING

- A. Provide where required

3.15 INTERIOR WATER DISTRIBUTION

- A. All interior water piping shall be run parallel with the lines of the building unless otherwise shown or noted on the Drawings and shall be concealed or run in the least conspicuous locations.
- B. All interior service pipes, valves and fittings shall be kept a sufficient distance from other work to permit finish covering not less than 1/2 inch from such other work.
- C. Furnish and install valves or stops on each connection to fixtures. Hot and cold water branches shall be valved as required.
- D. Complete provisions shall be made for expansion, contraction and draining of all supply piping. Install drain valves with chains and caps at all low points.
- E. Hot water pipe take offs shall have a minimum of three elbow swing.
- F. Mechanical make-up water shall be provided with a reduced pressure backflow preventer and capped for extension.
- E. Piping shall be tested and approved prior to backfilling or concealing.
- F. All open pipe ends, including grates of all drains, shall be temporarily sealed during construction to prevent the entrance of foreign debris.
- G. Buried piping shall be a minimum of three inch size and be uniformly supported along its entire length. The minimum vent through the roof size shall be three inch.
- H. The locations shown for buried sanitary are approximate only. Run the lines such that they are not installed within the "zone of influence" of the footings and below grade structures. In general, this means not below a 45 degree plane down and away from the lower edges of the footings.
- I. The Plumbing Subcontractor shall be responsible for the quality of all excavation, trenching and backfill and for monitoring that work sufficiently to ensure a quality installation.
- J. Piping through the building wall and at the building cleanout shall be caulked with lead and oakum. Offsets [caulked] in the sewer lines shall be provided in order to install the building cleanout in a direct line with the leaving sewer, in accordance with the code.
- K. All in-slab and underground work must be complete and tested prior to scheduled slab work. Any such work omitted or found defective after pouring of slabs will be the responsibility of this Subcontractor to correct, including but not limited to plumbing, excavation, backfill, compaction and concrete. This Subcontractor is responsible for the inspection of underground piping installed under this Sub-Contract and proper coordination of inspecting agencies and concrete schedule.

3.17 WATER SERVICE ENTRANCE

- A. The exterior water piping shall begin at the points indicated outside the building wall and run as indicated on the Drawings.
- B. Excavation for underground water piping shall be kept open until system is tested and approved.

3.18 EXTERIOR SANITARY SEWER

- A. The sanitary sewer shall run by gravity and extend to the points indicated outside the exterior building wall.
- B. Piping shall be tested and approved prior to backfilling.
- C. Provide a proper building cleanout for each service, just prior to the exit point, with proper access.

3.19 GAS SYSTEM

- A. Provide a complete natural gas system beginning from the discharge of the Local Gas Company's meter. Initiate the Owner's request for Service with the Gas company and coordinate the installation and timing of their work.
- B. All horizontal lines shall be graded not less than one-fourth [1/4] inch in fifteen [15] feet to drip pockets, which shall be readily accessible to permit cleaning and emptying. A suitable drip or condensation pocket shall be installed at service entrance, bottom of risers, and where required where condensate may collect. Furnish access panels for hidden drips.
- C. Each outlet, including a valve or cock outlet, shall be securely closed gas-tight with a threaded iron plug or cap immediately after installation and shall be left closed until this equipment or appliance is connected thereto.
- D. All branch outlet pipes shall be taken from the top or sides of horizontal mains and not from the bottom.
- E. Every regulator and gas device requiring venting shall be vented to the outside. Low and high pressure vents shall be kept separate.
- F. Paint all gas piping with a non-corrosive safety yellow paint

3.20 PIPE JOINTS

- A. All welding for gas piping shall be done in accordance with the welding procedures of the National Certified Pipe Welding Bureau, only by certified welders with certification provided prior to the start of work. Long radius welding fittings shall be installed on all welded lines. Branches from main piping shall utilize welding tees where branch size is main size or two [2] nominal sizes smaller except, where main is two and one-half [2 ½] inches or larger and branch size is two [2] inches or smaller utilize Thread-o-let. Weld-o-lets shall be utilized where branch size is three [3] sizes larger than branch. Mitering of pipe to form elbows, tees, or similar construction will not be permitted. All pipe to be welded shall be cut off clean in pipe machine and beveled.
- B. All screwed pipe joints shall have I.P.S. threads, and shall be made up with red lead and graphite ground in linseed oil applied to male threads only. All thread on pipe shall be full and cleaned out. Gas piping shall be made up with compound suitable for gas, similar to Rectorseal.
- C. Joints for buried hub-and-spigot cast iron soil pipe that are not gasketed shall be packed with picked oakum and caulked with molten pig lead. Twelve [12] ounces of fine soft lead shall be used for each joint for each inch in diameter of the pipe. Above-grade shall be made up with Anaheim Foundry Co. "Huskey" Series 4000 couplings. "Clamp All", "MG Coupling" or equal.
- D. Joints between cast iron and steel pipe shall be made up by screwing a half [1/2] coupling on the latter to form spigot head, then make a caulked joint as specified for cast iron pipe. Joints between copper and cast iron or steel shall be accomplished with suitable adapters.
- E. Soldered joints on water and waste piping shall be made up using lead free tin antimony and silver solder, conforming to Federal Spec. QQ-S-571c, and joint shall be filled the full length of the socket. The flux shall be applied evenly and tubing centered in socket of fitting. The fitting shall be heated evenly to the proper temperature to run the solder. The ends of the tubing and the inside of the fitting shall be thoroughly cleaned to a bright shining finish before applying flux. Flux shall be non-corrosive type conforming to Federal Spec. O-F-506.
- F. Flanged water pipe joints shall be made with compressed rubber gaskets, full face for flanges, minimum thickness one-sixteenth [1/16] inch.
- G. The Plumbing Subcontractor, if directed by the Designer is to cut joints as directed to demonstrate how joint is filled.

3.21 PLUMBING SYSTEM TESTS

- A. All plumbing and gas systems shall be tested by the Plumbing Subcontractor in the presence of the Designer or his representative and the Plumbing Inspector after completion of "ROUGHING IN" and before concealing any section from view.
- B. Furnish labor, tools, and all materials and do all testing as described herein.
- C. No piping shall be insulated until it has been pressure tested and proven tight. All new systems that can be isolated with valves shall be pressure tested and proven tight as described herein.
- D. Each system shall be pressure tested at pressures described herein and in a manner as described herein. Test pressures for each system shall be maintained as long as required by the Architects to determine the tightness of the system and/or as long as required to inspect the joints visually or with painted soap solutions. Wherever testing indicates leaks, the leaks shall be repaired in a manner prescribed by the Designer, and the test shall be reprocessed until the system is proven tight.
- E. Soil, waste and vent piping shall have openings plugged and the system above filled with water to the top of vent pipes. Water shall be allowed to stand a minimum of sixty [60] minutes or as long thereafter as is required for the complete inspection.
- F. Water piping shall be tested to a hydrostatic pressure of one hundred fifty [150] pounds per square inch and proven tight at this pressure. Test pressures shall be held for at least eight [8] hours minimum, or as long thereafter as is required to make the complete test.

Water piping to be concealed by structural work or put below grade shall be tested to the above pressure and proven tight before pipes are concealed.

- G. Furnish and make temporary installations of all pumps, compressors and instruments for the testing. Test pressures shall be held for at least the minimum time periods noted above, or long enough thereafter to prove the system shall be repaired or replaced as directed, and the expense shall be borne by the Plumbing Subcontractor. All soap tested joints shall be washed clean after testing, and test water properly drawn off.
- H. All gas piping shall be tested in accordance with the State Fuel Gas Code, and the State Plumbing Inspector, and in the Inspector's presence.
- I. The Plumbing Subcontractor shall ensure that the local gas co. tests all piping, regulators and devices that are installed by the local gas co. up through the meters and/or regulators.

3.22 CLEANING AND ADJUSTING

- A. At the completion of the work, all fixtures, equipment apparatus and exposed trim for this Section shall be cleaned and, where required, polished ready for use. Faucet washers

which have been damaged during construction shall be replaced. Drains and traps shall be thoroughly cleaned. At the completion of the work, all valves, faucets and automatic control devices shall be adjusted for proper and quiet operation.

3.23 DISINFECTION OF THE POTABLE WATER SYSTEM

- A. The entire water distribution system shall be disinfected in accordance with one of the following methods before it is placed in operation:
 - 1. The system, or part thereof, shall be filled with a water and chlorine solution which contains fifty [50] parts per million of available chlorine; and the same shall then be allowed to stand six [6] hours before the system, or part thereof, is flushed and returned to service. The system, or part thereof, shall be filled with a solution which contains one hundred [100] parts per million of available chlorine; and the same shall then be allowed to stand two [2] hours before the system; or part thereof, is flushed and returned to service.
 - 2. The Plumbing Contractor shall provide a certificate of disinfection.

3.24 INSTRUCTIONS

- A. After completion of assembly and installation of all systems, equipment and piping required under this Section of the Specifications, the Owner's supervisory and operating personnel shall be instructed regarding the operation and maintenance of the systems. The instructions shall be given by the Plumbing Subcontractor and other qualified personnel who are thoroughly familiar with all systems and shall last as long as necessary and be videotaped for the Owner's use.
- B. Submit to the Owner, lists for each system and piece of equipment indicating that all components have been checked and are complete prior to instruction period.
- C. Thoroughly instruct the Owner's authorized representative in the safe operation of the systems and equipment.
- D. Arrange and pay for the services of qualified manufacturers' representatives to instruct the Owner on specialized portions of the installation.
- E. Submit a complete record of instructions given to the Owner. For each instruction period, supply the following data:
 - 1. Date
 - 2. Duration
 - 3. System or equipment involved
 - 4. Names of persons giving instructions

5. Names of persons being instructed

6. Other people present

3.25 INSPECTION

A. Periodic inspections of the work in progress will be made to check general conformity of the work to the Drawings and Specifications.

B. Correct all deficiencies immediately upon notification.

3.26 CUTTING AND PATCHING

A. Refer to Section 01045 - CUTTING AND PATCHING

B. Give notification in time to other trades of openings required for Plumbing Work. Supply accurate details of location and size. When this requirement is not met, bear the cost of cutting and patching.

C. The General Contractor will do all cutting and patching required for the installation of the Plumbing Work.

D. Obtain written approval of Structural Engineer before cutting any openings through structural members.

3.27 PAINTING

A. Supply ferrous metal work, except piping, with at least one factory prime coat.

B. Finish painting will be carried out by SECTION 09900 - PAINTING.

3.28 INSULATION

A. General: All insulation shall be installed in strict accordance with the manufacturer's recommendations and shall be applied by a qualified insulation contractor. Covering shall not be applied on any apparatus or piping until the apparatus and piping have been thoroughly cleaned, tested and accepted as tight.

B. Piping: Pipe Insulation where vapor barrier jacket is required shall be installed with vapor barrier jackets drawn tight and firmly sealed to assure a positive vapor seal. End joints shall be covered with 4 inch wide butt strips of material identical to vapor barrier jackets, and they shall be drawn tight and securely sealed. The use of staples to secure insulation where vapor barrier jacket is required will not be acceptable.

C. Fittings and Valves: Cement or molded insulation on fittings and valve bodies shall be same thickness as adjacent covering and finished neatly to match the adjacent pipe insulation. Insulation at hangers, anchors and supports shall be neatly cut and fitted.

3.29 SYSTEM START-UP AND OPERATION

- A. The Plumbing Subcontractor shall provide all labor and materials and services necessary for the initial start-up and operation of all systems and equipment furnished and installed under this Section of the Specifications.
- B. This Subcontractor shall provide the services of a qualified representative for all major equipment pre-start, set-up, start-up and initial operation. Such periods shall be sufficient to insure proper operation of systems and equipment.
- C. This Subcontractor shall check all equipment during initial start-up to insure correct rotation, proper lubrication, adequate fluid flows, non-overloading electrical characteristics, proper alignment and minimal vibration. Systems shall be checked for water flows throughout without blockages.
- D. During operation of the systems qualified licensed personnel shall be provided and designated for maintenance of equipment and systems in good running order. Items such as strainer cleanouts, bearing lubrication, packing replacement and other consumables shall be provided without cost to the Owner. Failure of equipment during this period is the responsibility of the Plumbing Subcontractor, and continued failures shall be grounds for the Owner to not accept or pay for the work installed.

3.30 EXCAVATION AND BACKFILL

- A. All excavation and backfilling and related work, will be performed under DIVISION 2. The Plumbing Subcontractor shall be responsible for coordination and denoting the proper locations for buried work within the plumbing limits and for monitoring the work to ensure proper trenching, tunneling and backfilling.
- B. All work shall be done in accordance with the proper phasing and timing of the work and in accordance with the Plumbing Code.
- C. The Plumbing Subcontractor shall be responsible for the final preparation and final grading of all trenches.

3.31 RUBBISHREMOVAL

- A. Remove from the site and legally dispose of all cartons of rubbish and debris resulting from work under this Section not less than once per week.

3.32 CORE DRILLING

- A. All core drilling required for the installation of the plumbing systems is to be done by this plumbing Subcontractor. This Subcontractor is to carry all costs for core drilling. The General Contractor will not be responsible for any circular penetrations required for the proper installation of the plumbing systems. Locate all required openings and prior to coring, coordinate the opening with the General Contractor and all other trades. Do not

disturb existing systems. Thoroughly investigate the existing conditions in the vicinity of the required opening prior to coring. This Subcontractor shall be responsible for damage to the building and its systems from the coring operations. Disturbances from coring shall be kept to a minimum.

3.33 RECORD DRAWINGS

- A. Plumbing contractor shall keep a set of working drawings on site at General Contractor trailer/office. He shall mark in RED PENCIL, all changes made that vary from those drawings. At completion of the project, prior to final payment, he shall transfer the red pencil mark-ups on to AUTOCAD plumbing drawings (supplied by owner) and submit those drawings as "RECORD DRAWINGS" with the appropriate date of completion to the Architect and Building owner.

- END OF SECTION -

SECTION 23 00 00

HVAC FILED SUB-BID SUMMARY

PART 1 GENERAL

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this section shall include all plumbing construction for the Project, including all accessories identified within the specification sections referenced below, and necessary to provide a complete installation.
- B. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - 1. Section 23 10 00: HVAC.
- C. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above

listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.

- D. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- E. Waste Removal/Dumpster: This subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Temporary Weather Protection: The General Contractor shall provide tenting and heat to the work area, including to scaffolding provided by this section, during the months of November through March. This subcontractor shall remain responsible, without exception, for providing heat to masonry materials including unit masonry, sand, water, and other components to assure proper temperatures are maintained prior to installation
- G. Cutting and Patching: This Filed Sub-Bid Subcontractor shall be perform all cutting, coring, and/or patching required to complete the work of this section, except as specifically indicated in respective sections listed as part of the work of this Filed Sub-Bid. Where any of these sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching necessary for the work of this section shall be borne by this Subcontractor. All cutting, coring, and patching shall be coordinated through and by the General Contractor. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- H. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements all sections of the work.

Primary Drawings listed are those intended to indicate the Scope of Work for this trade.

- 1. T-1.1, Site 2, A-1.1, A-1.1 ALT, A-1.2, A-1.3, A-1.4, A-1.4 ALT, A-1.5, A-3.4, A-3.4 ALT, A-3.5, A-3.5 ALT, A-3.6, A-3.6 ALT, A-3.6A, , A-3.10, A-3.11, P-1.1, P-1.2, P-1.3, M-1.1, M-1.2, M-1.3, M-1.4, E-1.1, E-1.2, E-1.3, E-1.4, FP-1.1, FP-1.2, FP-1.3, FP-1.4
- l. In addition to the above listed "Primary Drawings" that define the scope of this section, this subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 22 00 - Unit Prices: Descriptions of unit price items, administrative requirements.
- D. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- E. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- F. Section 01 50 00 - Temporary Facilities and Controls.
- G. Section 01 57 21 - Indoor Air Quality Controls:
- H. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 REFERENCE STANDARDS

- A. Refer to individual specification Sections listed above for Reference Standards.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to each individual Specification Section listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 QUALITY ASSURANCE

- A. Refer to each individual Specification Section listed above for additional requirements.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Refer to each individual specification section listed above for specific warranties required.

PART 2 PRODUCTS (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR PRODUCT REQUIREMENTS)

PART 3 EXECUTION (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR EXECUTION REQUIREMENTS)

3.01 CLEANING

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 23-10-00

HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of Specifications.

1.02 DESCRIPTION OF WORK

- A. Work in this Section includes all labor, materials, equipment and services necessary to furnish completely and install all HVAC SYSTEMS, as indicated on the Drawings and specified herein, and in general as follows:
1. HVAC contractor shall furnish and install rooftop units as indicated on mechanical drawings. Furnish and install rooftop unit with all accessories indicated. furnish and install supply and return ductwork with complete distribution including air terminal devices.
 2. HVAC contractor shall furnish and install ceiling mounted toilet exhaust system with distribution ductwork and terminate duct through roof with gooseneck termination with spring assisted gravity backdraft damper. HVAC contractor shall furnish and install elevator vent system as indicated on the drawings.
 3. HVAC contractor shall furnish and install ductless split systems serving elevator machine room and IT closet.
 4. Balancing of all air systems.
 5. Furnish operating instructions and maintenance manuals.
 6. Record Drawings of the actual HVAC equipment installation.

1.03 RELATED WORK

- A. The related work shall be performed by the designated trades and under the respective sections. Coordinate closely with other trades and respective specification sections.

SECTION 08 31 00 - ACCESS DOORS Access doors to be installed under applicable sections.

- B. Related Work: The following items are not included in this section and will be performed under the designated sections and as indicated below:

1. SECTION 01 31 14 – PROJECT COORDINATION

- a. Coring, cutting and patching.

2. SECTION 01 50 00 – TEMPORARY FACILITIES

- a. Temporary heat, light, water, power and sanitary facilities for use during construction and testing.

3. SECTION 03300 – CAST-IN-PLACE CONCRETE

- a. Pads, concrete bases and form work.

4. SECTION 07 84 00 - FIRE STOPPING

- a. All firestopping where required around fire protection pipes.

5. SECTION 09 90 00 - PAINTING

- a. Painting of all exposed fire protection equipment not having enameled surfaces, stainless steel or chromed finishes.

1.04 CODES, PERMITS AND INSPECTIONS

- A. All work shall meet or exceed the latest requirements of all national, state, county, municipal and other authorities including Awarding Authority's Insurance Company exercising jurisdiction over construction work at the project.
- B. All HVAC permits and fees to local municipalities shall be provided by the HVAC Subcontractor.
- C. The HVAC Subcontractor shall be given the proper authorities, all required notices or information relating to work on his charge, pay all fees and obtain all official licenses, permits and certificates prior to installation prior to commencing any installation.

1.05 INDUSTRY STANDARDS, CODES, REFERENCES

- A. In these specifications, references made to the following industry standards and Code bodies are intended to indicate the latest volume or publication of the Standard. All equipment, materials and details of installation shall comply with the requirements and latest revisions of the following:

1. **2015 International Mechanical Code**
2. **ASHRAE** American Society of Heating, Refrigeration and Air Conditions Engineers
3. **NFPA** National Fire Protection Association
4. **OSHA** Occupational Safety and Health Act
5. **SMACNA** Sheet Metal and Air Conditioning Contractor's National Association
6. **UL** Underwriter's Laboratories
7. **EPA** Environmental Protection Agency
8. **NEC** National Electric Code
9. **NEMA** National Electrical Manufacturers Association

1.06 GUARANTEE

- A. Guarantee for all work provided under this Section shall be specified in the GENERAL CONDITIONS and the SUPPLEMENTARY GENERAL CONDITIONS.
- B. HVAC Subcontractor shall leave entire HVAC system in proper working order and shall replace any work, material or equipment provided by him under this contract which develops defects, except for ordinary wear and tear, within one year from the date of final certificate of approval and acceptance by the Owner, without additional expense to the Owner.

1.07 SHOP DRAWINGS

- A. Before ordering any material shipped to the job, this Contractor shall submit to the Architect for approval, shop drawings in quintuplet of the following items:
 - 1. Rooftop units
 - 2. Any other sample or shop drawing requested by the Architect.

1.08 OWNER'S MANUAL

- A. Furnish three sets of manuals, in bound form, containing data covering capacities, maintenance of operation of all equipment and apparatus. Operating instructions shall cover all phases of control.

1.09 REMOVAL OF DEBRIS

- A. This Subcontractor shall remove from site each day all accumulated rubbish and debris resulting from this operation.

1.10 INTENT

- A. The contract drawings indicate the intent, extent and general arrangement of the work. Small details not usually shown or specified but which are necessary to the proper installation and functioning of the work shall be included by the Subcontractor without additional cost to the Owner. Equipment shall be installed in accordance with the recommendation of the manufacturer and the best standard practice for the type of work.

1.11 SITE VISIT

- A. The Contractor shall visit the site and familiarize with the existing job conditions.

PART 2 - PRODUCTS

2.01 SHEET METAL WORK

- A. Furnish and install, in an approved manner, all sheet metal work that is indicated on the Drawings, or that is specified or required for the systems of supply, return and exhaust air distribution. All sheet metal work shall be manufactured and erected in a first-class and workmanlike manner, in accordance with the recommendations and requirements as set forth in the latest Duct Construction Standards, published by Sheet Metal and Air-Conditioning Contractors' National Association, Inc. (SMACNA) and shall be approved, shall be true to the dimensions indicated on the Plans and shall be straight and smooth on the inside, with neatly finished joints. The ducts shall be securely anchored to the building construction in an approved manner, and shall be so installed as to be completely free from vibration under all conditions of operation. All ducts shall be supported in accordance with requirements and recommendations of the SMACNA Duct Manuals. Ductwork shall be fitted with splitter dampers, volume dampers, adjustable air scoops and airfoil turning vanes to allow complete balancing and to provide the least resistance to airflow.
- B. Unless otherwise specified, all low velocity ducts shall be of the best bloom galvanized steel of U.S. Standard gauges specified herein and shall be stiffened by cross-breaking and by use of galvanized rolled steel angles, as specified herein:

<u>Rectangular Sizes</u>	<u>Gauge Numbers</u>	<u>Stiffeners</u>	<u>Stiffener Center Spacing</u>	<u>Support Center Spacing</u>
Up to 12"	26	Flat seam	Cross Break	96"
13" to 30"	24	Standing seams	48"	72"

- C. All duct sizes shown on the Drawings are clear inside dimensions.

2.02 FLEXIBLE CONNECTIONS

- A. The inlet and outlet of each fan shall be connected to the ductwork with a flexible connection. Flexible connections shall be secured to inlets and outlets with metal bands held in place with rivets or sheet metal screws. A minimum four-inch (4") space shall be maintained between duct and fan connection and the flexible connection shall be made of heavy reinforced canvas, as manufactured by Bauer and Black Company, Iden. Associates, Duro-Dyne Corporation, or approved equal.

2.03 INSULATION APPLICATION REQUIREMENTS

- A. Furnish and install covering and insulation, of the type hereinafter specified, on the following sheet metal ducts and equipment.
- B. All sealers, solvents, tapes, adhesives and mastics used in conjunction with the installation of all insulation specified under this section of the Specifications shall possess the maximum possible fire-safe qualities available and shall be of a type as approved under NFPA #90A and #90B Standards.

- C. Insulation shall be applied in a workmanlike manner so as to provide a neat and smooth surface suitable for painting. Work that is poorly done, or done in a manner not conforming to the Specifications and/or Drawings shall be repaired or replaced as directed by the Architect.
- D. Insulation shall not be applied to ductwork and related equipment until the systems have been proven tight or pressure tested.
- E. Sections of ductwork and equipment may be covered as the work progresses, provided the preceding requirements have been met for pressure testing and tightness.
- F. All ductwork, piping, and equipment to be covered shall be clean and dry prior to application of insulation.
- G. Insulation shall not be applied when ambient temperatures within the spaces are below 40°F.
- H. Insulation shall be carried full thickness through all floor and wall sleeves.
- I. All insulation shall be applied with edges tightly butted.
- J. All exposed ends on pipe insulation shall be sealed to make a complete vapor-tight installation.
- K. Equipment nameplates, labels and equipment access doors shall be left exposed.

2.04 INSULATION MATERIALS

- A. All insulation materials to be furnished for installation under this section shall be as manufactured by Owens-Corning Fiberglass Corporation, Johns-Manville, Gustin-Bacon or approved equal.
- B. Shop Drawings shall be submitted for all insulation system materials to be furnished for installation under this section of the Specifications. Submittals shall include a description of the application of all materials to be used for each type of insulation and catalog cuts of all materials furnished.
- C. All ductwork and equipment shall be insulated, as specified, and as indicated on the Drawings.

1. Ductwork Insulation [concealed]

All supply and return ductwork and plenums shall be insulated on the outside with two-inch thick flexible glass fiber blanket, Owens-Corning Fiberglass all service faced [Type 75] duct wrap, or approved equal. K-Factor shall not exceed 0.26 at 75°F ambient temperatures. Insulation shall be furnished with a factory applied soil-scrim-Kraft facing consisting of aluminum foil reinforced with fiberglass yarn mesh and laminated to 32 pounds chemically treated, fire resistant Kraft. Minimum "R" value of "R-6" shall be provided on ductwork within the building envelop and "R-12" where outside building envelop.

2. Ductwork [exposed]

All fresh air ductwork and plenums shall be insulated on the outside with Owens Corning type 705 rigid board insulation, 1" thick, factory applied FRK-25 foil-reinforced Kraft vapor retarders, minimum insulation R-value shall be 8.0

4. Insulation shall be omitted from exhaust ductwork.

2.05 BALANCING

- A. The final adjustment of all air systems shall be accomplished by an independent Balancing Sub-Contractor. The Balancing Sub-Contractor shall be knowledgeable of all types of low velocity air system.

The Balancing Sub-Contractor shall cooperate with the control manufacturer's representative in setting adjustment of automatically operated dampers, to operate as specified. The Balancing Sub-Contractor shall inspect all ductwork prior to closing-in to verify to his satisfaction that all fittings, dampers and balancing devices are properly fabricated and installed as specified, and that he will be able to properly balance the systems. All work performed shall be done in full accordance with minimum standards as set forth by the Associated Air Balance Council, N.S.F.M.I., Volume One, No. 81266.

- B. As part of the work of this Contract, the Balancing Sub-Contractor shall make any changes in the pulleys, belts and dampers or the addition of dampers as required for correct balance, at no additional cost to the Owner.

The Balancing Sub-Contractor shall furnish to the Designer for approval, four [4] copies of the test data showing the results of the various test requirements specified hereinafter.

- C. Test and adjust each air device to within ten percent [10%] of design requirements.
- D. Size, type, manufacturer of diffusers, grilles, registers and all tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations.
- E. Readings and tests of diffusers, grilles and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.
- F. It shall be the responsibility of the Balancing Sub-Contractor to secure fan and any other equipment data he may require on the HVAC equipment in order for him to complete the balancing as specified herein.

2.06 FIRE DAMPER

- A. Furnish and install, where indicated on the Drawings and where required by NFPA and all governing regulations, approved fusible link fire dampers.
- B. Fire dampers shall be factory fabricated of 16 gauge galvanized steel and shall have interlocking blades that fold out of the air stream, stainless steel bearings, 160°F. UL listed fusible line and unless otherwise noted, 1 ½ hour UL Fire Damper Label. The UL Label shall apply to the entire fire damper assembly for dynamic flow.
- C. Each fire damper shall have an air duct access door. Access doors shall be factory fabricated and shall be airtight when in the "Closed" position.

- D. Fire dampers and access doors shall be manufactured by Ruskin Manufacturing Company, Vent Products Company, Inc., Titus Manufacturing Corporation or approved equal. Fire dampers shall be installed in accordance with NFPA requirements.

2.07 AUTOMATIC TEMPERATURE CONTROL

A. GENERAL:

- 1. Furnish and install, as hereinafter specified, a complete electric/electronic temperature control system.
- 2. The control system shall be installed by competent control electricians regularly employed by the manufacturer of the product equipment. All control equipment shall be the product of one manufacturer.

B. SCOPE:

- 1. The control system shall consist of all thermostats, temperature transmitters, controllers, automatic valves, control panels, and other accessory equipment along with a complete system of electrical wiring to fill the intent of the specification and provide for a complete and operable system. All control equipment shall be fully proportioning, except as noted otherwise.

C. ELECTRIC WIRING:

- 1. All electric wiring and wiring connections required for the installation of the temperature control system, as herein specified, shall be provided by the temperature control contractor.

D. SEQUENCE OF OPERATION:

1. Roof Top Unit

- a. The roof top unit manufacturer will furnish thermostat, electronic damper and related devices. ATC Subcontractor shall wire the devices. Rooftop units RTU-4 and RTU-5 shall be furnished and installed with demand control ventilation.
- b. The electric cabinet unit heaters shall be furnished with wall mounted thermostats. Refer to tenants prototype drawings and specifications. Electric baseboard heaters shall be furnished with integral thermostats.

2.08 ROOF TOP AIR CONDITIONING UNITS

A. General

1. The General and Special Conditions, Section 15100, are included a part of this Section as though written in full in this document.
 2. Scope of the Work shall include the furnishing and complete installation of the equipment covered by this section, with all auxiliaries, ready for the Owner's use.
- B. Products
1. Rooftop Unit
 - a. Roof top unit [RTU] shall be packaged and include electric cooling and gas-fired heat, with capacity and steps of cooling and heating as shown on the drawings.
 - b. Unit shall be factory-charged and tested, shall be UL labeled and ARI certified by Standard 210 and 270, and shall be AGA certified.
 - c. Unit casing shall be heavy gauge galvanized steel or heavy gauge aluminum with protective coat of baked enamel. Weatherproof access panels shall be provided for access to all parts requiring service.
 - d. Compressor[s] shall be sealed or serviceable hermetic type and shall be resiliently mounted to avoid vibration and noise. Compressor shall be provided with antislugging protection, crankcase heater, and thermal cutouts and a hot gas cutout shall protect the compressor in addition to high and low pressure safeties. Standard controls shall permit operation down to 35 deg. F [2 deg. C], and compressor shall be locked out below this temperature.
 - e. Condenser fan[s] shall be direct-driven for the shaft of the slow-speed motor, which shall be designed for operation exposed to the weather.
 - f. Condenser coils shall have a subcooling section.
 - g. Refrigerant circuit shall include filter dryer, moisture indicator, sight glass and gauge ports.
 - h. Filter rack shall be provided for filters 1 inch j[25 mm] thick and shall filter both outdoor air and return air.
 - i. Evaporator fan shall be quiet-type centrifugal blower, directly connected to an adjustable-speed motor or belt driven with an adjustable-pitch pulley on the motor.
 - j. Heat exchanger shall be aluminized steel, designed for long life and quiet operation. Burner shall provide dependable and quiet ignition in the stages as called for.
 - k. Gas burner controls shall provide automatic safety pilot, dual automatic gas valves, manual gas cock, and pressure regulator. Ignition shall be electric for the intermittent pilot with 100% shutoff when the unit is off.
 - l. Induced draft blower shall provide prepurge and shall be provided with a proving switch to prevent burner operation if venter is not in operation.
 - m. Provide fan switch and limit control to delay the fan until heat is available and to continue fan operation until heat is dispersed. Limit switch shall shut the burner down in case of failure of operating controls.

2. Accessory Equipment
 - a. Condenser coil guards shall be provided for all units.
 - b. Roof mounting frame shall be provided for all units mounted on the roof. Frame shall be approved by the National Roofing Contractors Association. Provide all necessary flashing and counterflashing.
 - c. Provide “power saver” dampers and controls to provide “free cooling” from 0 to 100% outdoor air [OA] when the outside air humidity and temperature are acceptable. Provide OA, return air, and relief air dampers in a factory-provided enclosure. All air shall be filtered and bird screen shall be installed.
 - d. Provide a warm-up thermostat to prevent the OA dampers from opening if the return air temperature is below the set point [65 deg.F] [18 deg. C].
 - e. Provide necessary controls for operation of the compressor below the normal temperature of the compressor cutout. Operation shall be permitted down to temperature specified on drawings.
 - f. Provide factory-trained service person to check out the system, calibrate the controls, and see that the RTU is operating properly. The service person making the settings shall make a written report to the engineer and the Owner with all set points listed for future reference.
 - g. Rooftop units shall be furnished with factory fabricated roof curb, economizer section, power exhaust and 120 volt weatherproof GFIC type convenience outlet.
 - h. Provide thermostat and other controls required to produce the control functions called for.
3. Acceptable Manufacturers: Lennox, Carrier
 - a. RTU shall be the make and model number shown on the schedule on the drawings, or acceptable equivalents.

PART 3 - EXECUTION

3.01 OPERATION AND START-UP

- A. This Contractor shall furnish all labor, materials and equipment necessary to place the equipment into operation and then start and operate all systems to demonstrate the fitness of the installation.
- B. Prior to start-up, this Contractor shall check all equipment for rotation, check belts for tightness, provide lubrication, clean all equipment, perform pressure tests and make all other adjustments necessary for start-up.

3.02 COORDINATION

- A. The structure and its appurtenances, clearances and the related services, such as plumbing, heating, ventilating and electric service, have been planned to be adequate and suitable for the installation of equipment specified under this Section. The Owner will not assume any increase in cost caused by differing requirements peculiar to a particular make or type of equipment and any such incidental cost shall be borne by this Contractor. He shall be responsible for the proper installation and location of his required sleeves, chases, inserts, etc., and see that they are set in the forms before the concrete is poured. He shall be responsible for his work and equipment furnished and installed by him until the completion and final acceptance of this contract, and he shall replace any work which may be damaged, lost or stolen, without additional cost to the Owner.
- B. Cutting and Patching - It shall be the duty of this Contractor to consult with and give to the General Contractor the exact location and size of all openings and full information as to cutting and patching necessary for the same. In the event this Contractor fails to provide sleeves, inserts, and templates or fails to notify other Contractors well in advance of his requirements, he shall be responsible for paying for all cutting and patching made necessary by his failing to do so.
- C. In the event there is conflict or inadequate space for the proper installation of HVAC equipment, this Contractor shall prepare a scaled (1/4" = 1'0" minimum) composite sketch, showing the building structure and all equipment and items affecting the installation, to clearly identify the areas of conflict. This Contractor shall submit four (4) copies of the sketch, along with a written explanation of the problem, to the Architect for his review and determination on what action to take to resolve the conflict.

- D. It shall be the duty of this Contractor to furnish full information to all trades relative to the work they are to do in connection with work under this Section. This includes data for wiring, including wiring diagrams, equipment foundations, pipe connections, etc., furnished under other Sections.

3.03 TESTING

- A. Furnish all labor, materials, instruments, supplies and services and bear all costs for the accomplishment of the tests herein specified. Correct all defects appearing under tests and repeat the tests until all defects are disclosed. Leave equipment clean and ready for use.
- B. Perform all tests other than herein specified which may be required by Legal Authorities or by Agencies to whose requirements this work is to conform.
- C. Furnish all necessary testing apparatus, make all temporary connections and perform all testing operations required, at no additional cost to the Owner.
- D. All equipment and ductwork installed under this Contract shall be tested and found tight. Insulated or otherwise concealed piping shall be tested before being closed-in. All leaking joints shall be corrected, retested and found tight. Such tests shall conform to the requirements of local codes but shall not be less than the equivalent of the tests called for herein.
- E. Tests performed shall not relieve the HVAC Subcontractor of his responsibility if leaks develop after the tests are made.

3.04 FINAL INSPECTION

- A. When all HVAC work in this project has been completed as indicated on the Drawings and specified herein and is ready for final inspection, such an inspection shall be made by the Architect's and Owner's Representatives. At this time the HVAC Subcontractor for the work under this Section shall demonstrate that the requirements of these specifications and Drawings, have been met to the satisfaction of the Engineer and Owner.

- END OF SECTION -

SECTION 26 00 00

ELECTRICAL FILED SUB-BID

PART 1 GENERAL

SUMMARY

1.01 FILING OF FILED SUB-BIDS

- A. Filed Sub-Bids are required for work under this Section in accordance with the provisions of the General Laws of the Commonwealth of Massachusetts, Chapter 149, Sections 44A through 44J inclusive, as most recently amended.
- B. Filed Sub-Bids shall be submitted to the Awarding Authority as set forth in the Invitation to Bids and the Instructions to Bidders, accompanied by the bid bond specified herein.
- C. Every Filed Sub-Bid for work under this Section shall be on a form furnished by the Awarding Authority.

1.02 GENERAL REQUIREMENTS

- A. The Conditions of the Contract and General Requirements of the Project Manual apply to this Subcontractor, material suppliers, and all other persons furnishing labor and materials under this Section. The General Conditions, and applicable parts of Division 1 are included as part of this Section.
- B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The following definitions apply to the Drawings and Specifications:
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations".
 - 2. Install: The term "install" is used to describe operations at the Project Site including actual "unloading, unpacking, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 - 3. Provide: The term "provide" is used to mean "furnish and install, complete and ready for the intended use".
 - 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of 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.
- E. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four (24) hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed until it is completed.

1.03 DESCRIPTION

- A. The work of this section shall include all electrical construction for the Project, including all accessories identified within the specification sections referenced below, and necessary to provide a complete installation.
- B. The Work of this Filed Sub-Bid Section shall include the scope of each of the following Sections in their entirety:
 - 1. Section 26 10 00: ELECTRICAL.
- C. Staging and Scaffolding: The Work of this Filed Sub-Bid Section shall include all Staging and Scaffolding (including design, engineering, erection, maintenance, and removal) required to complete the work of the above

listed Sections. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.

- D. Temporary Hoisting Equipment and Machinery: The Work of this Filed Sub-Bid Section shall include all Temporary Hoisting Equipment and Machinery required to complete the work of the above listed Sections. All hoisting equipment and machinery and operation shall comply in all respects to the governing Laws and Codes. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- E. Waste Removal/Dumpster: This subcontractor shall be responsible for cleaning up their Work at the end of each day and placing all waste in the appropriate trash containers outside the building. The General Contractor shall provide trash containers and pay all costs associated with such containers and the proper, off-site, disposal of such containers. Refer to Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS for additional information.
- F. Temporary Weather Protection: The General Contractor shall provide tenting and heat to the work area, including to scaffolding provided by this section, during the months of November through March. This subcontractor shall remain responsible, without exception, for providing heat to masonry materials including unit masonry, sand, water, and other components to assure proper temperatures are maintained prior to installation
- G. Cutting and Patching: This Filed Sub-Bid Subcontractor shall be perform all cutting, coring, and/or patching required to complete the work of this section, except as specifically indicated in respective sections listed as part of the work of this Filed Sub-Bid. Where any of these sections indicate that cutting, coring, and/or patching shall be performed by others, the cost of such cutting, coring, and/or patching necessary for the work of this section shall be borne by this Subcontractor. All cutting, coring, and patching shall be coordinated through and by the General Contractor. Any and all cutting of structural members shall require approval of the structural engineer; refer to structural drawings for penetrations typically allowed and for required provisions related to such penetrations.
- H. This Filed Sub-Bid subcontractor shall fully coordinate the execution of the Work of this Section with, and anticipate the requirements all sections of the work.

Primary Drawings listed are those intended to indicate the Scope of Work for this trade.

- 1. All electrical and fire alarm drawings and the following:

T-1.1, SITE 2, A-1.1, A-1.1 ALT, A-1.2, A-1.3, A-1.4, A-1.4 ALT, A-1.5, A-3.4, A-3.4 ALT, A-3.5, A-3.5 ALT, A-3.6, A-3.6 ALT, A-3.6A, , A-3.10, A-3.11, P-1.1, P-1.2, P-1.3, M-1, M-2, M-3, M4, FP-1.1, FP-1.2, FP-1.3, FP-1.4, E-1.0,E-1.1,E-1.2,E-1.3.E-1.4.E-2.1,E-2.2,FA-1.0,FA-1.1,FA-1.2,FA-1.3

- l. In addition to the above listed "Primary Drawings" that define the scope of this section, this subcontractor shall review all other drawings in the construction documents and fully coordinate the work of this section with all other trades and subcontractors as shown in or reasonably inferred from the drawings.

1.04 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.
- B. Section 01 20 00 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.
- C. Section 01 22 00 - Unit Prices: Descriptions of unit price items, administrative requirements.
- D. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.
- E. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.
- F. Section 01 50 00 - Temporary Facilities and Controls and Section 01 51 00 - Temporary Utilities
- G. Section 01 57 21 - Indoor Air Quality Controls:
- H. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

- I. Section 01 70 00 - Execution Requirements: Examination, preparation, and general installation procedures; preinstallation meetings; cutting and patching; cleaning and protection; starting of systems; demonstration and instruction; closeout procedures except payment procedures; requirements for alterations work.
- J. Section 01 74 19 - Construction Waste Management and Disposal.
- K. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.05 REFERENCE STANDARDS

- A. Refer to individual specification Sections listed above for Reference Standards.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Refer to each individual Specification Section listed above for required Product Information, Samples, Shop Drawings, and other submittals required.

1.07 QUALITY ASSURANCE

- A. Refer to each individual Specification Section listed above for additional requirements.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Refer to each individual specification section listed above for specific warranties required.

PART 2 PRODUCTS (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR PRODUCT REQUIREMENTS)

PART 3 EXECUTION (REFER TO EACH INDIVIDUAL SPECIFICATION SECTION LISTED ABOVE FOR EXECUTION REQUIREMENTS)

3.01 CLEANING

- A. This Filed Sub-Bid Contractor shall be responsible for cleaning up his own work and depositing in dumpsters or separating for recycling. Dumpsters shall be provided by, and maintained (including payment for legal disposal off-site) by the General Contractor.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

**SECTION 26-10-00
ELECTRICAL**

PART 1.00 – GENERAL

1.01 GENERAL PROVISIONS

- A. Applicable provisions of “General Conditions” govern work under this section.
- B. The Electrical Contractor shall review all other sections of these Specifications for requirements therein affecting the work of this Section.
- C. The Electrical Contractor shall conform to all sections of these Specifications and Drawings.
- D. Contractor’s duties for work specified below shall include compliance with all Codes, Ordinances, Rules, Regulations, Orders and all other requirements of Authorities, which bear on performance of work.

1.02 SCOPE OF WORK

- A. Furnish all labor, supervision, permits, certificates, materials, equipment, apparatus, accessories, supplies, tools, transportation and services necessary for and incidental to, all electrical work as shown on the Drawings and/or specified hereinafter to the full completion of installation and operation of the electrical system.
- B. The principal items of work are as follows;
 - 1. Temporary Service
 - 2. Cable Television Service
 - 3. Telephone Service
 - 4. Fire Alarm Devices
 - 5. Grounding
 - 6. Power and lighting distribution panels
 - 7. Load Centers
 - 8. Lighting fixtures and lamps
 - 9. Lighting controls
 - 10. Safety switches
 - 11. Branch circuit wiring
 - 12. Outlet boxes, receptacles, etc.
 - 13. All wiring for heating ventilating equipment as required.
 - 14. Cable Television Wiring
 - 15. All other systems, equipment and work hereinafter specified and/or shown on the Contract Drawings.
- C. It is the intent of the Specifications and the accompanying Drawings that the systems shall be furnished and installed complete. The Electrical Contractor shall furnish and install all conduit, wire, boxes, equipment, devices and controls needed and usually furnished in connection with such work, whether specifically mentioned or not.
- D. The drawings and specifications are complimentary to each other. When a conflict arises between the specification and the drawings and/or within the drawings the more costly scenario shall, prevail until clarification from the engineer has been established.
- E. This Contractor shall refer to the Architectural, Structural, Plumbing, Mechanical and Fire Protection Drawings and all other Drawings associated with the project, prior to the installation or roughing of the electrical outlets, conduit and equipment to determine the exact location of all outlets.

1.03 WORK NOT INCLUDED

- A. The following items of labor and material incidental and/or related to the installation of the electrical work will be provided and/or installed under other sections of the Specification.

1. Painting of all equipment and material other than factory finished.
2. Flashing
3. Excavation and backfill.
4. Concrete work.

1.04 DEFINITIONS

- A. The "Electrical Contractor" specifically means, the Contractor working under this section for the specifications.
- B. "Furnish and install" or "provide" means to supply, erect, install and connect up complete, in readiness for regular operation, the particular work referred to unless otherwise specified.
- C. "Piping" includes, in addition to pipe, all fittings, boxes, hangers and other accessories relating to such piping.
- D. "Concealed" means hidden from sight, in chases, furred spaces, shafts and embedded in construction.
- E. "Exposed" means visible in sight, not installed "concealed" suspended or hung ceilings as defined above.
- F. "Approved Equal" means any equipment or material which is equal in quality, durability, appearance, strength, design and performance to the equipment or material specified and which will function adequately in accordance with the general design and is approved by the engineer.

1.05 CODES AND STANDARDS

- A. Unless otherwise specified or indicated, materials and workmanship shall conform to the latest edition of the following Standards, Codes, specifications, Requirements and Regulations.
 1. National Electrical Code
 2. State Electrical Code
 3. National Electrical Contractor's Association.
 4. National Electrical Manufacturer's Association
 5. International Building Code
 6. International Energy Conservation Code
 7. Underwriters' Laboratories, Inc.
 8. National Fire Protection Association
 9. Local Wiring Inspector
 10. Local Fire Marshall
 11. All other State and Local Codes and/or Authorities having jurisdiction, including any and all other paragraphs of this Specification.

1.06 PERMITS AND FEES

- A. There are no building permit fees. All Utility Company backcharges shall be paid by the owner prior to work being started.
- B. The Electrical Contractor shall carry in his bid price and pay all costs incurred for, standard and special tests to be performed in conjunction with this Contract that are necessary for and incidental to, the accomplishment of his work and the use of work when completed.
- C. The Electrical Contractor shall, after completion, furnish to the General Contractor a Certificate of Final Inspection and Approval from the Local Electrical Inspection Department.

1.07 MATERIALS AND WORKMANSHIP

- A. Materials and workmanship shall be the best of their respective kinds and in full accordance with the most modern construction methods.
- B. Electrical materials and equipment of types for which there are Underwriters' Laboratories standard requirements, listings or labels, shall conform to their requirements and be so labeled.

1.08 TESTS

- A. The right is reserved to conduct acceptance tests of all equipment, wiring or any other work furnished under these Drawings and/or Specifications to determine the fulfillment of specific requirements and/or design.
- B. The Electrical Contractor shall conduct all such tests in the presence of authorized representatives of the Owner and at such times that the Owner may designate.
- C. The Electrical Contractor shall perform all tests, supply all instrumentation, personnel and make all adjustments of equipment and wiring as may be necessary. The Electrical Contractor in the presence of the Owner's representative shall take insulation resistance reading of all equipment and circuits. Megger readings of less resistance than the recommended minimum as called for by the National Electric Code shall be required or conductors shall be replaced by this Contractor at no cost to the Owner.

1.09 PORTABLE OR DETACHABLE PARTS

- A. The Electrical Contractor shall retain in his possession and shall be responsible for, all portable and/or detachable parts and portions of the installation, including fuses, keys, locks, adapters, blocking clips, inserts, lamp instruction, drawings and all other devices or materials that are relative to and necessary for the proper operation and maintenance of the electrical system until final completion of his work.
- B. The Electrical Contractor shall replace all stolen, lost or damaged items relative to the installation and operation of the electrical system at his own expense before the building is accepted by the Owner.

1.10 PROTECTION AND CLEANING OF EQUIPMENT

- A. All electrical equipment, upon receipt, shall be adequately stored and protected from damage.
- B. After inspection, all electrical equipment shall be protected to prevent damage during the construction period. Openings in all conduits, raceways, fittings and boxes shall be closed to prevent entrance of foreign materials.
- C. Before completion of work and before final inspection, all damaged and/or defective equipment and material shall be replaced and all exposed surfaces of electrical equipment shall be clean.

1.11 DRAWINGS AND SPECIFICATIONS

- A. The Drawings and these Specifications are complimentary to each other and any labor or material called for by either, whether or not by both, necessary for the successful operation of any of the particular types of equipment furnished under this Contract, shall be furnished and installed.
- B. Before installing any of the electrical work, see that it does not interfere with the clearances required for existing finished columns, pilasters, partitions, or walls. Installed work, which interferes with other trades, shall be changed as directed by the Owner's representatives. All costs incidental to such changes shall be paid by the Electrical Contractor.

1.12 OBTAINING INFORMATION

- A. Obtain detailed information from the manufacturers of apparatus, which he is to furnish and install as to the proper method of installing and connecting same. Obtain all required information from the Owner's representative and other Subcontractors necessary to facilitate and complete the electrical work. Check all other Contract Drawings and all other sections of Contract

Specifications for electrical equipment requiring connections and electrical characteristics of equipment should they differ from the Electrical Drawings.

1.13 SAFETY PRECAUTIONS

- A. The Electrical Contractor shall furnish, place and maintain power guards and other necessary construction, required for the prevention of accidents to secure safety of life and/or property.

1.14 REMOVAL OF RUBBISH

- A. After completion of the work, the Electrical Contractor shall remove all waste, rubbish and other materials left as a result of his operations and leave the premises in clean condition.
- B. In addition to the cleaning up required in the Special Provisions, the Electrical Contractor shall, at the completion of the work, clean, polish, and/or wash all exposed items or materials, equipment and fixtures in this Contract, so as to leave such items bright and clean.
- C. The Electrical Contractor shall repaint any painted metal surfaces, which have been scratched, dented, or marred.

1.15 COORDINATION OF TRADES

- A. The Electrical Contractor shall give full cooperation to other trades and shall furnish (in writing, with copies to Engineers) any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
- B. Where the work of the Electrical Contractor will be installed in close proximity to work of other trades or where there is evidence that this Contractor will interfere with the work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Designer, the Contractor shall prepare composite working Drawings and sections at a suitable scale not less than $\frac{1}{4}''=1'-0''$, clearly showing how his work is to be installed in relation to the work to correct the condition without extra charge. All cutting and patching, excavation and backfill shall be done by the General Contractor. The Contractor shall inform the General Contractor well in advance as to his requirements.
- C. The Electrical Contractor shall be responsible for phasing the electrical installation in accordance with the General Contractor and the construction schedule.

1.16 VISITING THE SITE

- A. The Electrical Contractor shall be required to visit the site and examine the existing conditions, which may affect his work under this Contract. Failure to do so shall be his responsibility and no claims for extra compensation or extension of time shall be allowed because of lack of compliance herewith.
- B. The Electrical contractor shall familiarize himself with each portion of each building and how the phasing may effect the electrical installation.

1.17 FIELD MEASUREMENTS

- A. The Electrical Contractor shall verify in the field all measurements necessary for his work and shall assume responsibility for their accuracy.

1.18 GUARANTEE

- A. The Electrical Contractor guarantees by his acceptance of the Contract that all work installed will be free from any and all defects in workmanship and/or materials during period of one (1) year

from date of Certificates of Completion and acceptance of work. If any such defects in workmanship or material appear, he will, without cost to the Owner, remedy such defects within a reasonable time.

1.19 SHOP DRAWINGS AND SAMPLES

- A. Before ordering material shipped to the job, the Electrical Contractor shall submit to the General Contractor for approval manufacturers references and bulletins, Shop Drawings, in sextuplet, giving all details, dimensions, etc. of the following;
 - 1. Main Service equipment
 - 2. Main Distribution Panel, Panelboards and Load Centers
 - 3. All lighting fixtures and lamps
 - 4. Time Controllers
 - 5. Disconnect switches
 - 6. Fire Alarm equipment (all components)
 - 7. Emergency Lighting System equipment
 - 8. Building Cable, wire, Conduit and electrical commodities
 - 9. Cable Television System equipment and cable
 - 10. Tel/Data System equipment and wiring
 - 11. Wiring Devices (each type)
 - 12. Lighting Controls and Lighting Control Panel
 - 13. Intercom System
- B. The Electrical Contractor shall also furnish samples of plug receptacles, light switches and other small parts as requested by the Architect.
- C. Should the Electrical Contractor choose to substitute for the specified equipment, the Shop drawing submittals must include catalog cuts of originally specified equipment. Shop Drawings submitted for approval without all of the required information will not be considered for approval.

1.20 SUPERINTENDENCE OF WORK

- A. The Electrical Contractor shall give his personal superintendence to the work and shall retain at the job site during the period of construction, a competent Foreman, satisfactory to the Contractor, who shall be in full charge of the work under this section.

1.21 STORAGE OF MATERIALS

- A. The Electrical Contractor shall store his material and equipment before installation only where designated by the General Contractor. He shall be responsible for all his property stored on the premises and shall hold the General Contractor free from liability for loss by theft or carelessness of employees of the General contractor or of other Sub-Contractors. The Electrical Contractor shall take particular care to protect any finished work for injury or defacement and must remedy, at his expense, any injury caused thereto by his operations.

1.22 RECORD DRAWINGS

- A. The Electrical Contractor shall maintain at the site a set of black line prints on which shall be accurately shown the actual installation of work under this section of the specifications. The drawings shall indicate any variation, approved by the General contractor, from the Contract Drawings, including changes in sizes, locations and dimensions. The Electrical Contractor shall deliver to the General Contractor for submittal to the Owner, a complete set of reproducible Record Drawings, showing the entire work as actually installed and two (2) sets of black or blue line on white prints.

1.23 CONTRACT DRAWINGS

- A. The Contract Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangements of equipment, conduits, piping and fixtures.
- B. If directed by the General Contractor, the Electrical Contractor 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. All wiring device locations in dwelling units shall comply with the spacing requirements of Article 210 of the National Electrical Code whether or not shown on the drawings. Reasonable modifications to the locations are acceptable due to structural framing and/or wall stud locations.

1.24 TEMPORARY SERVICE

- A. Coordinate and provide services as outlined in Sections 01 50 00 Temporary Facilities and Controls and 01 51 00 Temporary Utilities for temporary lighting and service.

PART 2.00 – PRODUCTS

2.01 RIGID STEEL CONDUIT

- A. All rigid steel conduits shall have a hot-dipped galvanized coat plus a secondary coat, galvanized threads, bear an Underwriters' Laboratories label and shall conform to Federal Specifications WW-C-581d and American Standards Association Specification C80.1. The conduit shall be fully threaded at both ends and each length shall be furnished with one standard threaded coupling. The use of threadless conduit couplings and fittings will not be permitted. Threaded split couplings of the bolted clamp type are permitted. Rigid steel conduit shall be used for all power wiring where indicated.
- B. Galvanized rigid steel conduit sweeps and quarter bends shall be installed at the pad mounted transformers and at the utility company poles. Each sweep to a pole shall extend ten feet up the pole with galvanized rigid steel conduit.
- C. Galvanized rigid steel conduit shall be installed where conduit needs to pass under roadways.

2.02 ELECTRICAL METALLIC TUBING

- A. Electrical metallic tubing shall be Electro-galvanized outside and enameled inside. All electrical metallic tubing shall bear an Underwriters' Laboratories label and shall conform to Federal Specifications WW-C-563 and American Standards Association Specification C80-3.
- B. Couplings and fittings for EMT shall be of the compression type or setscrew type. EMT shall not be installed embedded in concrete, outdoors or in wet locations.
- C. Any exposed wiring within any of the buildings shall be installed in Electrical Metallic Tubing.

2.03 FLEXIBLE METALLIC CONDUIT

- A. Flexible metal conduit shall be galvanized steel, and shall contain an integral copper-grounding conductor. Liquid-tight flexible metal conduit shall be similar, but shall also have an extruded moisture and oil-proof outer jacket of polyvinyl chloride plastic.
- B. Flexible metal conduit shall be utilized on all vibrating electrical equipment and shall be no greater than three feet in length.
- C. Liquid-tight flexible conduit shall be utilized on final connections to any outdoor equipment.

2.04 PVC CONDUIT

- A. Plastic conduit shall be PVC Schedule 40, iron pipe size, rigid polyvinylchloride equal to or better than ASTM Pipe Material ASTM PVC conduit Type 2, Grade 1, ASTM PVC 2110, Specification P-1785, Underwriters' Laboratory, Inc. approved for lengths beyond ten (10) feet shall be identical to the approved conduit. Where elbows are used, they shall be long radius type. PVC Conduit shall be manufactured by Kraloy, Barrett Division of Allied Chemical, Pittsburgh; Triangle Cable and Conduit Co., or approved equal.
- B. Schedule 40 PVC conduits shall be installed in concrete buried in earth as indicated on the drawings.

2.05 WIREWAYS

- A. Totally enclosed sheet steel wireways, complete with all fittings, tees, elbows, wire retainers, closure plates, hangers, and component parts required for a complete installation shall be installed in all areas indicated on the Drawings and as required to facilitate the installation of the electrical systems.
- B. Physical size, length, and internal cross sectional areas, of the wireways shall be determined in the field by the Electrical Subcontractor to suit field conditions unless noted otherwise on the Drawings.
- C. The wireway systems shall be constructed of code gauge galvanized sheet steel with hinged cover. Straight sections of the wireway system shall be constructed of two separate pieces of sheet steel. One piece shall be used to form the sides and top, the other to form the cover. Captive screws, furnished as a part of the wireway system, shall be used for sealing at all hinged covers and coupling at straight sections or fittings.
- D. All fittings, elbows, tees, and straight sections of the wireway shall be provided with smooth and round edges to protect the wiring from abrasion. All welded seams and joints shall be ground and polished to remove burred edges.
- E. A bonding jumper consisting of an insulated flexible #8 AWG copper conductor with soldered eyelet on each end shall be provided to bond and ground the wireway at each joining section of the wireway system. The bonding jumpers shall be attached to each section by means of a bolt, locknut, and washer. The Electrical Subcontractor shall remove the paint from the wireway at the contact points so that positive contact shall be made between the bare metals at each grounding point.
- F. The wireway system shall be provided with ½ inch and ¾ inch concentric knockouts every 6 inches on center along the top and ½ inch, ¾ inch, 1 inch, and 1-1/4 inches concentric knockouts every 6 inches along both sides.
- G. All sheet metal posts shall be factory primed with rust inhibiting phosphor coating and finished with USASI #24 dark gray enamel. All hardware shall be cadmium-plated to prevent rusting and corrosion.
- H. All lengths, connectors, and fittings of the wireway systems shall be UL approved and bear the Underwriters' Laboratories label. UL listing of lengths without listing of connectors and associated components or fittings shall not be acceptable.
- I. The wireway system, all component parts and fittings, shall be by one manufacturer and shall be manufactured by Kelek, Lee Products, or Keystone.

2.06 OUTLET, PULL AND JUNCTION BOXES

- A. The locations of all wall switch boxes shall be coordinated with the Drawings and Project Manager before installation of same. All switch boxes unless specifically noted otherwise on the Drawings shall be opposite the hinged side of the door for all single doors.
- B. The location of outlets shown on Drawings is approximate. The Electrical Contractor shall study the building plans in relation to the spaces and equipment surrounding each outlet, so that receptacles, switches, lighting fixtures, devices, or other electrical components are symmetrically

- located and mounted in or on the walls, ceiling, and floor. Spacing of the devices within the dwelling units shall be in accordance with Article 210 of the national Electrical Code.
- C. Outlet, junction or pull boxes, shown on the Drawings, that interfere with the installation of mechanical equipment, structural or architectural features, or that will be inaccessible due to the work of other trades shall be relocated accordingly.
 - D. Outlet, junction or pull boxes that are not specifically shown on the Drawings but are required for the proper installation of the electrical system shall be installed by the Electrical Contractor, so that they do not interfere with the structural or architectural features and the installation of materials by the other trades.
 - E. Any reasonable change in the location of outlets, pull or junction boxes requested by the Architect, prior to roughing, shall not involve additional expense to the Owner.
 - F. All outlet, pull and junction boxes shall be installed in a rigid and satisfactory manner and shall be supported by bar hangers in frame constructions or shall be fastened directly with wood screws or 16 penny nails on wood, bolts with expansion shields on concrete or brick, toggle bolts on hollow masonry units and machine screws or welded threaded studs on metal. Threaded studs of the proper type and holding capacity driven in by a powder charge and provided with lock washers and nuts are acceptable for mounting of boxes on solid concrete walls or slabs. Preset inserts of the proper type and holding capacity shall be used in overhead slab construction wherever possible for the support of pull and junction boxes.
 - G. Feeders passing through pull or junction boxes shall be individually grouped and bound with tie-raps. The feeders in each pull or junction box shall be properly tagged to clearly indicate their electrical characteristics, circuit number and panel designation. Cables shall be supported on suitable racks within the boxes and arranged in an orderly manner. Normal/Emergency circuits shall be installed in separate pull or junction boxes from Normal only circuits.
 - H. Flush mounted ceiling and wall outlet boxes shall be provided with the proper type extension rings, tile and plaster collars required to set flush with the finished surfaces of the ceiling or walls.
 - J. Outlet boxes shall, in general, be as follows:
 - 1. Recessed outlet boxes in non-hazardous locations shall be non-metallic, fiberglass impact resistant outlet boxes. The boxes shall be constructed to withstand extreme temperatures. Boxes shall not melt or distort due to high heat or shatter in extreme cold. All the non-metallic boxes shall be rated for use within Fire Walls. Boxes shall be secured to wood studs with nails, to sheet metal studs with pierce point sheet metal screws or a universal "Z" hanger that allows the box to mount to wood or metal studs.
 - 2. Recessed outlet boxes for non-hazardous locations in areas where type "MC" cable is required shall be the pressed sheet steel, zinc coated, and cadmium plated type.
 - 3. Exposed, surface and pendant mounted outlet boxes or outlet boxes installed in normally wet locations shall be of the cast metal type with threaded hubs as manufactured by Crouse-Hinds, Appleton, Red Dot, or Russell and Stoll.
 - 4. Outlet boxes shall not be less than 1-1/2 inches deep unless shallower boxes are required by structural conditions and are specifically approved by the Architect.
 - 5. Ceiling and bracket outlet boxes shall not be less than 4 inch octagonal, except that smaller boxes may be used where required by the particular fixture to be installed. Flush or recessed fixture shall be provided with separate outlet boxes where required by the fixture terminal temperature requirements.
 - 6. Outlet boxes on the exterior of the building shall be provided with UL Listed weatherproof covers that allow a plug to be in place with the cover in closed position. Covers shall be single gang, horizontal duplex, "while-in-use" application in accordance with Article 406 of the National Electric Code and as manufactured by Thomas & Betts.
 - 7. Outlet boxes for general use, flush mounted in concrete work and walls in non-hazardous and normally dry locations, shall be manufactured by Allied Moulded Products, Inc., Steel City, Appleton, or Raco.
 - 8. All outlet boxes shall be sealed with an approved sealant or pads on all sides so that air flow does not leak into the finished space from the wall or ceiling cavity. All finished outlet plates shall be caulked with Phenoseal or other approved caulking on all edges of each plate. Phenoseal color shall match the color of the faceplate.

- J. Pull and junction boxes shall, in general, be as follows:
1. Pull and junction boxes shall be constructed of code gauge galvanized sheet metal, of not less than minimum size required by the N.E.C. or other applicable Specification "STANDARDS" and shall be furnished with securely fastened covers. Boxes exceeding 48 inches in any direction shall be properly reinforced with angle iron stiffeners.
 2. Pull and junction boxes of other than standard manufacturer's trade size shall be manufactured by Steel City or Keystone.
 3. Standard trade size pull and junction boxes shall be produced by the manufacturers listed above as applicable.
 4. Pull and junction boxes to be installed in normally wet location areas shall be of the cast type with threaded hub and gasketed coverplate. The cast pull and junction boxes shall be manufactured by Crouse-Hinds, or Appleton.
- K. Outlet, pull, and junction boxes shall be properly sealed during the course of construction to prevent the entrance of dirt and foreign materials within same or the raceway system of which it is a part. The Electrical Contractor shall provide temporary covers for all open boxes. Paper may be solidly packed into standard work boxes to prevent the entrance of dirt and foreign materials, in lieu of coverplates if so elected by the Electrical Contractor.

2.07 AIR VAPOR BARRIER BOX

- A. Electrical contractor shall provide air-vapor barrier boxes at outlet boxes installed within any vapor barrier to provide airtight construction around all the outlets.
- B. The air-vapor barrier boxes shall be made of rigid polyethylene with a hinge feature to allow easy installation of any standard electrical outlet box.
- C. The air-vapor barrier boxes shall be installed by the electrical contractor and sealed by the air sealing contractor.
- D. The air-vapor barrier boxes shall be designed and installed to protect the seal made around the wires that enter or leave the box.
- E. The air-vapor barrier box shall allow for inspection and verification of a complete seal with air vapor barrier material before the wall is closed. This shall be coordinated in the field with the air sealing contractor.

2.08 FIRE STOPPING

- A. Electrical contractor shall provide Intumescent fire stopping all around each conduit that penetrates a rated wall, floor and/or ceiling. Fire stop putty shall allow 10% movement and be water-based intumescent acrylate and have a shelf life of 12 months. The fire stopping shall be skin forming within 15 minutes and have an application temperature from 5 degrees C to 40 degrees C. Fire stopping shall be manufactured by Hilti.
- B. Fire stop putty pads shall be installed around outlet boxes that are located on party walls and/or fire rated walls or ceiling assemblies. Putty pads shall be intumescent, non-conductive, synthetic rubber and free from asbestos. The putty pads shall have an application temperature from 5 degrees C to 35 degrees C and a reaction temperature of 140 degrees C with a shelf life of 24 months. Putty pads shall be FM and UL 263 approved and manufactured by Hilti.

2.09 METAL CLAD CABLE

- A. All conductor wires and cables for secondary circuits shall consist of thoroughly tinned 98 percent conductivity copper, with 600 volt thermoplastic-covered (75 degrees C) insulation with an interlocked metal sheath, manufactured in strict accordance with the requirements of the Board of Underwriters' and the A.I.E.E..

- B. Wires, #10/2 w/GRD., #12/2 w/GRD., and #14/2 w/GRD., Metal Clad cable, type "MC", shall be type "THHN" solid, unless otherwise noted or shown on plans; sizes #6 AWG and larger shall be stranded Type "THHN".
- C. No wire smaller than 14/2 w/GRD. metal clad cable shall be used for any branch circuit. Larger sizes shall be used where so indicated on the plans.
- D. All wire shall be color-coded.
- E. All wire and cable shall be as manufactured by General Cable, Rome Cable, Anaconda, or approved equal.
- F. Type MC cable shall not be used in concrete, direct buried in earth or where exposed to chemical vapors.
- G. Type MC cable can be used as panel feeders, branch circuits, run exposed, run concealed, in raceway, as open runs above ceilings, etc.
- H. Type MC cable shall be secured by insulated staples, cable-ties, straps and/or hangers at intervals not to exceed 6'-0" on center and within 12" of every cabinet, box or fitting.
- I. In addition to the line and neutral conductors, all Metal Clad cable shall be equipped with a full size, green insulated ground conductor that runs the entire length of every branch circuit. Type "AC" shall not be permitted.

2.10 NON-METALLIC SHEATHED CABLE

- A. All conductor wires and cables for secondary circuits shall consist of thoroughly tinned 98 percent conductivity copper, with 600 volt thermoplastic covered (75 degrees C) insulation manufactured in strict accordance with the requirements of the Board of Underwriters' and A.I.E.E.
- B. Wires, #10-2 w/GRD., #10-3 w/GRD., #12-2 w/GRD. and #12-3 w/GRD. Non-metallic sheathed cable shall be type "TW" solid, unless otherwise noted or shown on the plans. Wire sizes #6 AWG and larger shall be stranded Type "THW". Wires underground or in slabs on grade shall be "THW" in concrete encased conduit, unless shown or noted otherwise.
- C. No wire smaller than 14-2 w/GRD., non-metallic sheathed cable shall be used for any branch circuit. Larger sizes shall be used where so indicated on the Plans.
- D. All wire shall be color coded.
- E. All wire and cable shall be as manufactured by General Cable, American Flexible Cable Company, Anaconda, or approved equal.
- F. Type NM cable shall not be used in commercial buildings, Building classified as type I or Type II construction, in concrete, direct buried in earth or where exposed to chemical vapors.
- G. Type NM cable can be used for branch circuits, run exposed, run concealed, in raceway, as open runs above ceilings, etc.
- H. Type NM cable shall be secured by insulated staples, cable-ties, straps and/or hangers at intervals not to exceed 6'-0" on center and within 12" of every cabinet, box or fitting.
- I. In addition to the line and neutral conductors, all Non-Metallic Sheathed cable shall be equipped with a full size, green insulated ground conductor that runs the entire length of every branch circuit.

2.11 WIRES AND CABLES

- A. Unless otherwise specified, all wires and cables shall be thoroughly tinned 98% conductivity copper, single conductor type "THHN" moisture and heat resistant polyvinylchloride thermoplastic for use at 600 volts A.C. and D.C., rated 60 degrees C. operating temperature. Wires and cables #6 AWG and larger shall be type "THHN", unless noted otherwise. The wires and cable shall have the Underwriters' Laboratories, Inc. label and be surface printed throughout the entire length at two-foot intervals with permanent identifying markings indicating manufacturer's name, size, type, and voltage. All wire and cable shall be furnished on reels or spools and in lengths required to minimize splicing.
- B. Services entrance conductors, conductors buried below grade and/or conductors exposed to the elements shall be type "THWN" and meet the criteria mentioned above.

- C. Fixture wiring for use on 250 volts A.C. shall be type XFF, cross linked, polyfin insulated, #14 AWG, 300 volts.
- D. Feeders and Branch circuit wire in continuous raceways shall be type "THHN", heat resistant, nylon covered thermoplastic.
- E. Emergency feeders shall be NEC Type RHH/RHW and installed in conduit. These feeders shall be utilized in areas that are not sprinkled, and a one hour barrier and/or fire rated assembly does not exist.
- F. Wires of #12, and #10 AWG shall be solid, #8 AWG and larger shall be stranded.
- G. Wires and cables #2 AWG and smaller shall be of continuous solid colors follows:
 - 1. SYSTEM VOLTAGES: 120/208 3 PH., 4 WIRE

Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Equip.Grd.	Green
 - 2. All wires larger than #2 AWG shall be color-tape coded at all terminations.

2.12 LIGHTING FIXTURES

- A. The Contractor shall furnish and install the lighting fixtures, complete for each and every light outlet in the type quality, and size of fixture indicated on the Plans and in the Lighting Fixture Schedule. It shall be the responsibility of this Contractor to check the Plans with the Schedule for completeness. All ancillary equipment such as; madison bars, reflectors, ballasts, lamps, back boxes, etc shall be the responsibility of this contractor so that all light fixtures are complete and operable and are secured properly to the surface they are mounted to.
- B. This Contractor shall include all fixture wiring, hanging, uncrating, connecting up and making ready for operation. All fixture wire for fixtures shall not be less than #16 gauge, but larger if capacity of fixture requires it, and finished with asbestos-covered wires where exposed to excessive heat.
- C. This Contractor shall include the cost of furnishing and installing all lamps for all fixtures under this Contract throughout. All lamps for all fixtures shall be furnished in types as indicated. All lamps for Rapid-Start fixtures shall be General Electric or Sylvania, as called for under each fixture type.
- D. The Contractor shall check structural and architectural details of all locations where fixtures are to be installed so that he can properly provide for installation of the fixtures.
- E. The electrical contractor shall furnish and install an ***E.Z. Barrier*** at all the down light locations that penetrate the rated ceiling assembly. The barrier shall maintain the fire rating indicated by the architectural drawings and specifications. The barrier shall comply with UL 263, UBC 7-1, NFPA 251 and ASI A2.1. The barrier shall be certified with American Society for Testing Materials (ASTM) specifications ASTM E119-00a, "Standard Methods of Fire Tests of Building Construction and Materials".

2.13 LIGHT SWITCHES (*Federal Spec. Grade*)

- A. All local wall switches shall be of the flush Quiet toggle type, single pole, double pole, three-way or four-way, as required and as manufactured by Pass & Seymour / Legrand.
- B. All switches shall be suitable for the control of tungsten filament lamps, fluorescent loads and shall carry the proper marking of the Underwriters' Laboratories.
- C. In all dwelling unit bathrooms the toggle switch that controls the vanity light shall be a lighted when "OFF" toggle switch. The lit toggle switch shall be Pass & Seymour / Legrand # PS20AC1-CSL.
- C. All occupancy sensors shall be Passive Infrared / Microphonic technology with settings that range from 4 second to 20 minutes. The devices shall be wall mounted or ceiling mounted as indicated on the drawings. Sensors shall be digital pulse to interface with the microprocessor in the lighting control panels. Sensors shall be capable of multi-sensor application to allow for zone control.

- D. Switches and Occupancy Sensors shall be equal to the following Pass & Seymour / Legrand devices:

Single-pole PS20AC1-W, White
Three-way PS20AC3-W, White
120 Volt Fluorescent Dimmer PS93884-W, White
120 Volt Fluorescent Dimmer PS91180-W, White
Ceiling Mounted Sensor, Watt Stopper LMUC-100-2
Ceiling mounted Hallway Sensor, Watt Stopper LMUC-100-2
Wall Mounted Sensor, Watt Stopper LMSW-101 for a single load
Wall Mounted Sensor, Watt Stopper LMSW-102 for bi-level switching

2.14 RECEPTACLES (Federal Spec. Grade)

- A. All convenience outlets shall be of the single or duplex type, back or side wired, T-slot and polarized slot type. All receptacles shall be of the grounded type and be rated 20-amp as indicated. Receptacles shall be manufactured by Pass & Seymour / Legrand and shall be Plug tail style.
- B. Receptacles in residential units shall be TR rated.
- C. Receptacles must feature a solid brass strap with integral ground break-off ears, brass auto ground clip crimped to the strap, wrap around face locking strap and locking drive screws and wide body design.
- D. All receptacles must be finger safe with built-in brass terminals to accept plug tail connector with solid or stranded #12 awg conductors, including the ground conductor. The connector shall have large brass contacts with an audible snapping latch to assure connection and allow release.
- E. All receptacles must be finger safe with no exposed terminals after installation and shall have circuit identification in the label on the face of each receptacle.
- F. Exposed molded parts of the receptacles must be constructed of high impact-resistant nylon or polycarbonate and must match the faceplates.
- G. In general, convenience outlet circuits shall be independent of light circuits and shall not be controlled by light circuit switches or light switches, unless specifically shown.
- H. All twenty-amp circuits indicated on the drawings shall be wired to twenty amp devices. The use of a fifteen amp rated receptacle on a twenty-amp circuit is not acceptable.
- I. Standard duplex receptacles specified shall be used for dual circuited receptacles by removal of break-off shunt.
- J. Exterior receptacles and/or receptacles in wet locations shall be provided with an "in-use" cover in accordance with Article 406 of the National Electrical Code. Covers shall be polycarbonate construction with a watershed channel, cord flap gasket, 1" profile and have the ability of being installed without removing a device through the use of keyed mounting holes. In-use covers shall be manufactured by Pass & Seymour/Legrand # WIUC10-SC
- K. All receptacles installed throughout the building complex shall be as follows, or equal to:
1. Duplex convenience receptacles 20A, 125V., single phase, 3 wire U-slot grounded type shall be Pass & Seymour / Legrand #PT8300/PT6STR.
 2. Duplex 20A, feed thru, 125V, 1-phase, 3-wire, U-slot ground fault interrupting convenience receptacle shall be Pass & Seymour / Legrand #2094-I.
 3. Dryer outlets, 30A, 250V, NEMA 10-30R, 3-wire, grounded type receptacle as manufactured by Pass & Seymour / Legrand.
 4. Range outlets, 50A, 250V, NEMA 14-50R, 3-wire, grounded type receptacle as manufactured by Pass & Seymour / Legrand.
 5. Exact NEMA configuration of all special purpose outlets shall be coordinated in the field with the equipment manufacturer and/or the General Contractor.

2.15 MISCELLANEOUS GENERAL PURPOSE DEVICES

- A. All other special and general-purpose receptacles called for on the Drawings shall be of the same grade as indicated above, white phenolic compound finish and manufactured by Pass & Seymour / Legrand or equal.

2.16 DEVICE PLATES

- A. All plates used on switch and plug receptacles in finished spaces where wiring is concealed, shall be non-metallic type. Plates on exposed conduits to be sherardized. Non-metallic type shall be ivory color to match devices.
- B. Gang plates shall be used where multiple switches and/or receptacles occur at one location.
- C. Plates shall be of the same manufacturer as the wiring devices.

2.17 FLUORESCENT BALLASTS

- A. All fluorescent ballasts as indicated shall be of the electronic type and their design and construction shall conform to the CBM Standards certified by ETL.
- D. The ballast fill material shall be of thermosetting type and shall not soften under failure. The ballasts shall be equipped with an internal automatic resetting thermal protector adjacent to the coils. The ballast case temperature shall not exceed 90 degrees C in continuous operation.
- E. Fluorescent ballast's shall be electronic type with full light output as manufactured by Magnetek Company or approved equal.
- D. Ballast's shall be Instant Start, Class P and shall be in accordance with the schedule set forth by the National Electrical Code.
- E. Compact Fluorescent ballasts shall be One-Lamp, Encapsulated, Electronic type. Ballasts shall be Class P with sound rating A and Automatic Resetting feature. Compact Fluorescent ballast's shall be as manufactured by Magnetek Company or approved equal.
- F. Compact Fluorescent Dimming ballast's shall be One-Lamp, Encapsulated, Electronic type at full light output. Dimming Ballast's shall be Class P with sound rating A and Automatic Resetting feature. Dimming Ballast's shall be capable of dimming down to 10 percent of the rated lumen output using a standard U.L. listed incandescent dimmer switch. Compact Fluorescent Dimming ballast's shall be manufactured by Advance Transformer Company, Energy Saving Ballast's Company or approved equal.

2.18 LIGHTING CONTACTORS

- A. Lighting contactors shall be suitable for ballasted lamps and filament at 480 volts maximum.
- B. The lighting contactors shall be 12 poles and mechanically held and designed to handle the switching of tungsten or ballasted lamps as well as other non-motor loads.
- C. The contactors shall be designed to withstand the large initial inrush currents of tungsten and ballast lamp loads as well as non-motor (resistive) loads without contact welding
- D. The contactors shall be rated 30 amperes per pole.
- E. The contactors shall have an interlock that removes the power from the pickup coil and shall require application of power to release the contactor to the OFF position
- F. The contactors shall be capable of operating such that it will not switch to OFF during power failure to the control circuit
- G. The contactor shall be installed in a NEMA 1 enclosure
- H. Mechanically-held contactors shall be Eaton / Cutler-Hammer type C30CN for 30 ampere rating.
- I. 30 ampere rated contactor shall have finger safe terminals and normally open and normally closed poles shall be interchangeable where the installation of the pole on the contactor base determines if the pole is normally open or normally closed and not the pole itself. Contactor shall be field configurable from electrically held to mechanically held.

2.19 A.C. PANELBOARDS

- A. Panelboards and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA and UL as follows:
1. UL 67 – Panelboards
 2. UL 50 – Cabinets and boxes
 3. NEMA PB1
 4. Fed. Spec. W-P-115C
 5. Circuit breaker – Type I class I
- B. The convertible distribution and lighting circuit breaker panelboards shall be the dead-front type and shall be in accordance with the Underwriters' Laboratories, Inc. "Standard for Panelboards", and "Standard for Cabinets and Boxes" and shall be so labeled.
1. All cabinets shall be made of code gauge steel or better and if painted shall be undercoated with a rustproof bonderized surface or galvanized and treated with a non-acid agent prior to painting. Fronts, provided with doors, shall be cold-rolled sheet steel with gray finish. Directory frames shall be included on the backs of all doors. All locks shall be keyed alike. Fronts shall be furnished with approved adjustable trim clamps and means shall be provided for entrance to gutter space, lugs, etc.
 2. Circuit breakers shall be of the bolt-on type, stab types will not be permitted, indicating "ON-OFF" "TRIPPED" positions of the operating handle. When the breaker is tripped automatically, the handle shall assume a middle position between an overload on one pole shall automatically cause all poles to open. Two or more single pole breakers with one handle extension will not be permitted. The circuit breakers shall be quick-break on manual, as well as automatic operation and shall have inverse time characteristics secured through the use of a bi-metallic tripping element supplemented by a magnetic trip. Circuit breaker arc quenching shall be equal to or better than the "De-Ion" arc extinguishing principle.
 3. All panelboard assemblies shall be factory assembled complete with circuit breakers as shown on the Contract Plans. Interiors shall be so designed and assembled that any individual breaker can be replaced without disturbing adjacent units or without removing main bus or branch circuit connectors. All bussing shall be copper. Main buses and back pans of distribution and power panelboards shall be of such design that branch circuits may be changed without additional machining, drilling, or tapping. Where copper contact surfaces are furnished on main and branch circuit connectors, the copper shall have a 1,000 amperes/square inch density and contact surfaces of not more than 200 amperes per square inch. Silver Plated contacts which meet the same values are acceptable. Lighting and power branch circuit panelboards shall be so designed that the branch circuit connections to the main bus provide sequence (fully distributed) phasing, and such connections shall be clearly and permanently identified on the face of the front of the panel interior.
- C. A.C. Power Distribution Panels shall be convertible circuit breaker distribution Panelboards as manufactured by Cutler Hammer.
- D. Frame size for each breaker shall be as shown on the Contract Plans. All bussing shall be copper. The bare, solid, copper neutral bus shall be electrically insulated from the panel and a separate, bare copper grounding bus shall be provided in each panel. Copper ground bus shall be the equivalent of the solid neutral bus. Buses shall be clearly identified.
- E. A.C. Lighting Panels shall be circuit breaker Panelboards as manufactured by Cutler Hammer. Frame size for each breaker shall be as shown on the Contract Plans. All bussing shall be copper. The bare solid copper neutral bus shall be electrically insulated from the panel and a separate, bare copper grounding bus shall be provided in each panel. Copper grounding bus shall be the equivalent size of the solid, neutral bus. Buses shall be clearly identified.
- F. Trims for branch circuit panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semi flush cylinder lock and catch assembly. Doors over 48 inches in height shall have auxiliary fasteners.
- F. A directory card with a clear plastic cover shall be supplied and mounted on the inside of each door. All locks shall be keyed alike.

2.20 **LOADCENTERS**

- A. The Contractor shall furnish and install loadcenters incorporating circuit breakers of the number, rating and type as specified herein and as shown on the contract drawings.
- B. The loadcenter and all components shall be designed, manufactured, labeled and tested in accordance with the latest applicable standards of UL and NEMA including:
 - 1. UL 67 – Standards for Panelboards
 - 2. UL 50 – Standards for Cabinets and Boxes
 - 3. UL 489 – Standards for Molded Case Circuit Breakers
 - 4. UL 869 – Standards for Service Equipment
 - 5. Federal Specification W-C 375B – Circuit Breakers
 - 6. Federal Specification W-P 115b – Panel Power Distribution Type 1, Class 2.
- C. The manufacturer of the loadcenters shall be the manufacturer of the circuit breaker within the loadcenter. All breakers shall be full size.
- D. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- E. Loadcenters shall be rated for 240 volts AC and shall have short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 10,000 amperes RMS symmetrical.
- F. Breakers shall be a minimum of 125-ampere frame. Breakers 10- through 125-ampere trip size shall take up the same pole spacing.
- G. Loadcenters shall be labeled with a UL short-circuit rating. When series ratings are applied with integral or remote devices, a label shall be provided. Series ratings shall cover all trip ratings of installed frames. It shall state the conditions of the UL series ratings including:
 - 1. Size and type of upstream device
 - 2. Branch devices that can be used
 - 3. UL series short-circuit rating.
- H. Loadcenters shall be Cutler-Hammer type CH or approved equal meeting all ratings and features specified herein.
- I. All interiors, with the exception of the branch circuit breakers, shall be completely factory assembled with main breaker, main lugs or no main device as indicated.
- J. Interiors shall be so designed that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.
- K. Physical means must be provided to prevent the installation of more over-current devices than that number for which the enclosure was designed. Full size breakers are required.
- L. Bus bars for the main and cross connectors shall be of copper construction in accordance with UL standards. Busing shall be braced throughout to conform to industry standard practice governing short-circuit stresses in load centers. All connection points shall be tin-plated copper. Bus bars shall be mounted to a rigid metal backpan.
- M. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection of same ampacity as the branch conductor.
- N. All wire connectors and terminals shall be of the anti-turn solderless type and suitable for copper or aluminum wire of the sizes indicated. All connectors shall meet the "Requirements for Wire Connectors and Soldering Lugs" UL 486B.
- O. All loadcenters shall be suitable for use with 60/75 degrees C rated wire.
- P. Circuit breakers shall be molded case type, 3/4-inch wide per pole. Multi-pole circuit breakers shall be of a stack pole design to provide electrical phase isolation and have an internal common trip.
- Q. Each pole of a multi-pole circuit breaker shall have inverse time delay overload and instantaneous short-circuit protection by means of both thermal and magnetic sensors.

- R. The circuit breaker calibration shall not be affected by environmental changes in relative humidity. Breakers shall be calibrated after assembly.
- S. All circuit breakers shall be operated by a toggle-type handle and multi-pole circuit breakers shall have an internal common trip mechanism. The circuit breakers shall incorporate trip mechanisms that are mechanically trip-free from the handle. The handle position shall provide good visual trip indication.
- T. Contacts shall be of non-welding silver alloy.
- U. All circuit breakers shall be molded case thermal-magnetic quick-make/quick-break, over toggle type. Loadcenters shall be suitable for use in systems having a short-circuit capacity of 10,000 RMS amperes at the loadcenter location as indicated on the drawings.
- V. Branch breakers shall be full-size and have a range of 10 amperes through 125 amperes.
- W. All terminals shall be listed for use with copper or aluminum conductors. Terminals shall be of the box lug design. The terminals shall meet UL 486B requirements and shall be suitable for use with either 60 degree or 75 degree C wire. (Unless otherwise specified)
- X. Breakers shall be SWD rated and/or HACR rated as required.
- Y. Where indicated on drawings, supply arc fault circuit interrupters (AFCI) or arc fault circuit interrupters with ground fault circuit interruption (AFCI w/GFCI). The breaker shall provide parallel arc detection and protection in addition to overload and short-circuit protection. AFCI breakers shall be "Classified for mitigating the effects of arcing faults" or conforming to UL Standard 1699 and as defined by article 210 of the 2011 NEC.
- Z. Ground bars shall be positioned in the load center to accommodate the plug-on neutral style arc fault circuit interrupters (AFCI). AFCI's shall be provided without neutral pigtails to maximize gutter space within the load center tub.
- AA. Loadcenters shall have NEMA 1 general purpose enclosures as indicated on the drawings and shall be flush mounted, except where noted.
- BB. Boxes shall be made from cold rolled code gauge sheet steel having multiple knockouts, except where noted. Boxes shall be of sufficient size to provide at least a minimum code gutter space on all sides.
- CC. Boxes shall be factory assembled into a single rigid structure and be provided with circuit breaker marking labels and directories.

2.21 SAFETY SWITCHES AND FUSES

- A. Safety switches shall be of the fusible or non-fusible type as indicated on Drawings equipped with an external lever or handle for manual operation. Each unit shall be enclosed in a code-cage, sheet steel cabinet suitable for surface mounting as indicated on the drawings. Surface mounted units shall have hinged door and catches. Neutral conductors shall be solid throughout. Weatherproof switches shall be of the NEMA 3R type.
- B. Safety switches shall be heavy-duty type as manufactured by Cutler Hammer.
- C. Furnish and install a complete set of fuses for installation and deliver to the Owner one complete set of spare fuses for each installation. Fuses shall be as manufactured by Chase Shawmut, Bussman, or Littlefuse/Tracor.
Electrical contractor shall furnish and install a safety switch for each Fan Coil Unit and Condensing Unit indicated on the drawings. These switches shall be located so that they are accessible for operation in accordance with the Massachusetts State Electrical Code.

2.22 GENERAL PANEL INFORMATION

- A. All panels shall be properly balanced, the circuit numbers on the Plans being a numerical indication rather than any attempt to indicate proper balance.
- B. Care shall be taken in the use of a common neutral to make certain that no more than one leg is taken from each phase.

- C. Typed indexes shall be provided in each panel indicating circuit number and the outlets or items controlled or fed from same.

2.23 MODULAR METERING EQUIPMENT

- A. Furnish and install the service entrance rated modular metering equipment as herein specified and shown on the associated electrical Drawings. The modular metering shall meet all the requirements set forth by Underwriters' Laboratories and shall be listed and labeled.
- B. Modular metering shall consist of a tap box and/or a main switch for the service. The rating shall be as indicated on the drawings. The tap box or the main switch shall be bolted to a NEMA 3R, single-phase modular meter sections with built-in tenant circuit breakers. Number of meters and circuit breakers shall be as indicated on the drawings. Modular metering equipment shall be manufactured by Cutler Hammer or approved equal.
- C. House panel meters shall be equipped with a circuit breaker (rating as indicated on the drawings) and lever by-pass kit on the respective meters in accordance with the local Utility Company requirements.
- D. All metering equipment shall be provided with copper bussing and bolted connections to provide one continuous structure.

2.24 MAIN DISTRIBUTION EQUIPMENT

- A. Furnish and install the service entrance switchboards as herein specified and shown on the associated electrical drawings. The switchboards shall meet all the requirements set forth by Underwriters' Laboratories and shall be listed and labeled.
- B. Each switchboard framework shall be fabricated on a die-formed base or base assembly consisting of formed steel and commercial channel welded or bolted together to rigidly support the entire shipping unit for moving on rollers for mounting. The framework is to be formed code gauge steel, rigidly welded and bolted together to support all cover plates, bussing, and component devices during shipment installation. Each switchboard section shall have an open bottom and individual removable top plate for installation and termination of conduit. Top and bottom conduit area is to be clearly shown and dimensioned on the Shop Drawings. The wireway front covers are to be hinged to permit access to the branch breaker load side terminals without removing the covers. All closure plates shall be screw removable and small enough for easy handling by one man. The paint finish shall be gray enamel over a rust-inhibiting phosphate primer.
- C. The switchboard bussing shall be plated copper and of sufficient cross-sectional area to continuously conduct rated full load current with a maximum average temperature rise of 65 degrees C. above an ambient temperature of 40 degrees C. The bus bars shall be rigidly braced to comply with the integrated equipment rating of the switchboard. The horizontal bus bars between sections shall be located on the back of the switchboard to permit a maximum of available conduit area. The end section is to have bus bar provisions for future addition of a switchboard section. The provisions shall include the bus bars installed to the extreme side of the switchboard and prepunched to facilitate future bolted splice plates. The horizontal main bus bar supports, connections, and joints are to be bolted with grade 5 carriage bolts and Belleville washers to be free of required periodic maintenance. The switchboard shall be bus sized and metered as shown on the Drawings.
- D. Each switchboard, as a complete unit, shall be given a single-integrated equipment rating to meet the available fault current as coordinated with the local utility company or a minimum of 65,000 amperes symmetrical fault current or larger as recommended by the manufacturer. The switchboard manufacturer shall certify that all equipment is capable of withstanding the stresses of a fault equal to that of the fault current mentioned above at lowest rated overcurrent protective device contained therein. Certification shall be established by factory tests done by the manufacturer on similar equipment. This test data shall be available and shall be furnished to the Engineer, if requested, with or before the submittal of approval Drawings.
- F. Distribution circuit breakers shall be 80 percent rated, group mounted with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Each breaker shall have a circuit cardholder and neatly printed card identifying the circuit.

- Tripped indication shall be clearly shown by the breaker handle taking a position between ON and OFF. The entire switchboard shall be manufactured by Eaton/Cutler Hammer or General Electric.
- G. The electrical contractor shall be responsible for a complete coordination study to properly set all adjustable settings on circuit breakers. A copy of the coordination study shall be submitted to the engineer and the owner as part of the as-built drawings.

2.25 MOTOR WIRING

- A. The Contractor shall do all wiring required for plumbing, ventilating and heating motors including mounting of switches and starters, as well as wiring of same. All wiring for the control of motors unless indicated on Electrical Plan, shall be provided under HVAC, Plumbing and Fire Protection.
- B. The Contractor shall furnish and install horsepower rated disconnecting means as required by the National Electrical Code for all motors. Motor-driven equipment specified under "Plumbing" and "Heating and Ventilating" may be factory wired complete with controller and motor disconnects; the Contractor shall coordinate equipment purchased under these divisions so as to provide any necessary equipment. Motor disconnects shall be unfused unless noted otherwise. Single-phase motor disconnects may be a thermal switch.
- C. Each disconnect shall be clearly labeled with a screw fastened ¼" engraved nameplate stating load controlled.

2.26 MOTOR STARTERS AND CONTROLS

- A. Motors will be furnished and installed under the respective Sections of the Specifications under which the equipment is specified.
- B. Motors ½ hp and larger will be 3 phase, 60 Hertz; motors less than ½ hp will be 120 volts, single, 60 Hertz, except specifically noted equipment.
- C. All motor starters and controls unless furnished as an integral part of the equipment, shall be provided with suitable metal enclosures and shall conform to the NEMA Industrial Control Standards.
- D. All motor starters shall have individual running overcurrent protection in each phase and shall be provided with two sets of auxiliary contacts. Starters for single-phase motors shall be 2 pole and for 3 phase motors shall be 3 pole.
- E. Manual starters shall be of the toggle mechanism type for full voltage starting. Magnetic starters shall be across-the-line type, minimum size NEMA 1 equipped with Hand-Off-Automatic switch.
- F. Each motor starter and each control station shall be clearly labeled with screw fastened ¼" engraved nameplate stating equipment controlled.

2.27 SECONDARY ELECTRICAL SERVICE

- A. Secondary electrical service shall commence at a secondary connection of the utility company mounted transformer.
- B. Electrical Contractor shall furnish and install conduit, wire and compression connectors from the secondary connections at transformer to main breaker in the building. Sizes of which shall be indicated on the Drawings.
- C. Electrical Contractor shall furnish and install all panels, switches and any other equipment shown on the Drawings or herein indicated to assure a complete working system.
- D. Electrical Contractor shall furnish and install a concrete envelope around the secondary conduits as indicated on the drawings. The duct bank assembly shall be buried a minimum of 36 inches below the finished grade and each duct bank section shall have a yellow warning tape run the entire length of the each duct bank. Backfill in trenches shall be select with no stone or rock larger than a ½" in diameter.

2.28 NAMEPLATES

- A. Nameplates shall be furnished and installed on all panelboards, pull boxes, cabinets, for all special purpose switches, motor disconnect switches, remote control stations, motor starters and other controls furnished under this Contract, to designate the equipment controlled and function.

Nameplates shall be laminated black bakelite with ¼ inch high white recessed letters.
Nameplates shall be securely attached to the equipment with galvanized screws or rivets.

2.29 SUPPLEMENTARY STEEL, CHANNEL, AND SUPPORTS

- A. The Electrical Contractor shall furnish and install all supplementary steel, channels, and supports required for the proper installation, mounting and support of all lighting fixtures and electrical equipment, to be installed under this Contract, as required.
- B. All supplementary steel, channels, and supports shall be furnished, installed, and secured with all fittings, support rods, and appurtenances required for a complete support mounting system.
- C. The type and size of the supporting channels and supplementary steel shall be determined by the Electrical Contractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with requirement for loading.
- D. All supplementary steel and channels shall be installed in the neat and workmanship manner parallel to the walls, floor, and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

2.30 TELEPHONE UNDERGROUND CONDUIT SYSTEM

- A. Furnish and install all conduits from the nearest telephone company handhole/manhole/pedestal point of connection to the main backboard indicated in the building as indicated on the Drawings. Excavation and backfilling shall be furnished under another section of this Specification.
- B. Lay conduits in trenches in true alignment and sloped for drainage. All conduits shall slope away from the building. Slope shall be continuous minimum of 3" in 100' unless otherwise noted.
- C. All conduits shall be encased in concrete.
- D. Materials: Schedule 40 PVC conduit as manufactured by Carlon, in 10' lengths, including all couplings and appurtenances necessary for laying in complete conduit line.

2.31 VOICE/DATA SYSTEM

- A. Backboards for voice/data equipment shall be furnished and installed by this Subcontractor. Main backboard shall be as dimensioned on the Plans. All backboards shall be painted black on both sides with fire resistant paint.
- B. The electrical subcontractor shall be responsible for extending the voice/data services to each dwelling unit as indicated on the plans.
- C. The electrical subcontractor shall furnish and install all equipment to the Main Backboard. The Electrical Contractor shall furnish all conduit and sleeves where required. The Electrical Contractor shall furnish and install all voice / data outlets and all wiring indicated below.
- D. All backboards shall be furnished with a ground bar with insulated stand-off secured to the backboard. A #6 bare copper ground conductor shall be bolted to the ground bar with a two hole high compression connector on one end of the cable and the other end of the cable shall be connected to a piece of bare building steel with an approved connector. The ground bar shall be capable of handling at least 12 subordinate connections.
- E. The electrical subcontractor shall be responsible for extending the voice/data services to the dwelling unit interface panels as indicated on the plans.
- F. Voice/data system wiring and devices shall be as follows:
 - 1. Each dwelling unit shall be equipped with a network interface panel with a built in receptacle as described on the drawings.
 - 2. Each dwelling unit will be equipped with a telephone outlet in each bedroom, each living room and in each kitchen.
 - 3. The electrical contractor shall pre-wire the building for telephones as indicated on the drawings. Inside each dwelling unit the wiring shall homerun from each outlet, back to a dwelling unit interface panel and be terminated. Each outlet will be a single RJ45 female jack mounted to an outlet box and wired with a minimum of (1) one, Category 6, 8/C #24 plenum rated cable.

4. The electrical contractor shall provide one (1) microduct from the main backboard to each dwelling unit interface panel. Each dwelling unit interface panel will be equipped with a duplex receptacle wired to the nearest room receptacle, 110 punch down blocks and/or RJ45 patch panels.
5. The electrical contractor shall coordinate with the telephone service provider for the installation of the copper back bone to the building.
6. The main back board in the building shall be equipped with a powered quadplex power outlet and a #6 bare copper ground.
7. Each dwelling unit shall be fed with at least (2) two, Category 6, 8/C #24 plenum rated cables for telephone service from the service provider.
8. All voice conductors shall be white in color and consist of plenum rated, 8/C #24 awg Category 6 solid annealed copper, individually insulated with high density PVC, and tough PVC outer jacket, to each outlet. Cables shall be terminated to a RJ-45 jacks at the outlet locations indicated on the drawings.
9. Cables shall be UL CM rated, meet U.L. 444 and NEC article 800 requirements.
10. All cables and their installation methods shall comply with Article 800 of the National Electric Code. All cables shall be supported by means of "J" hooks, "D" rings, cable management trays, or a unistrut support hung from the building structure. Cables shall not be fastened in any way to conduit, piping, duct work or any other trade component.
11. All jacks, patch panels, 110 punch blocks, etc shall be manufactured by Ortronics.
12. All voice/data cables and patch cords shall be manufactured by Berk-Tek.
13. All cables shall be certified and copies of the test reports shall be turned over to the owner in a three ring binder.

2.32 CABLE TELEVISION SYSTEM

- A. Enclosures and Lock Boxes for cable television splitters and cable television equipment shall be furnished and installed by this Subcontractor. Enclosures and Lock Boxes shall be located in the main electric room in each building as indicated on the drawings and coordinated with the local service provider.
- B. The electrical subcontractor shall be responsible for extending the cable television service cables to each dwelling as indicated on the plans.
- C. The Electrical Contractor shall furnish all conduit and sleeves and fire stopping where required. The Electrical Contractor shall furnish and install all cable television outlets and all wiring as indicated below.
- D. Cable Television system wiring and devices shall be as follows for the buildings:
 1. The electrical contractor shall provide a conduit with pull wire from a handhole/manhole/pedestal in the street to the main enclosure and/or splitter in the main electrical room of each building. This room shall be equipped with a cable television backboard, a powered quadplex power outlet, and a #6 copper ground conductor.
 2. The electrical contractor shall coordinate with the local service provider to provide the Hard Line Cable TV service to each building and the trunk cable to each dwelling unit.
 3. The electrical contractor shall furnish and install a single RG6 Quad shield coaxial cable from the main electric room to each dwelling unit interface panel and terminate the cable on a splitter within this panel. These lengths of cable will be coordinated with the service provider.
 4. Each dwelling unit shall be equipped with cable TV outlets in each bedroom and in each living room. The electrical contractor shall provide wiring from the splitter in the respective dwelling unit interface panel to each outlet listed above in each unit.
 5. Each dwelling unit Cable TV outlet shall consist of a phenolic faceplate with a built-in "F" connector mounted to an outlet box.

2.33 VIDEO INTERCOM SYSTEM

- A. Each building shall be provided with audio and color video communication between the main entrance and each dwelling unit by a visitor pushing the dwelling call button. The resident responds by pushing the Talk button to carry on a two-way conversation while viewing the visitor. Once the resident has acknowledged the visitor the Key pushbutton is pushed to allow the visitor access to the building.
- B. Each system shall be capable of handling up to 16 Entry panels and 500 tenant stations and shall be Aiphone GH series.
- C. Entry Panels:
 - 1. The system shall be installed to provide access control for the building tenants. The system control panels shall be equipped with Vandal-Resistant metal push buttons, a poke resistant, 16 gage sheet metal speaker grill and locking mechanism and a clear color video camera. The metal buttons shall be constructed such that vandals cannot melt them with cigarettes or lighters.
 - 2. The entry panel shall be capable of being configured for digital name scrolling or direct select. The entry panels shall have a vacuum fluorescent display for tenant names, a 10-key pad for calling tenants.
 - 3. The entry panels shall be Corrosion Resistant anodized aluminum to withstand environmental abuse. The panel shall be modular in design and provide a clear indication of all key pad buttons.
 - 4. A built-in white LED shall automatically activate in low light conditions to provide a clear video images to the tenant stations.
 - 5. The digital scrolling entry panel shall allow visitors to easily find tenants by name or unit number.
 - 6. Up to 20 access codes shall be available to activate electric strikes or magnetic locks.
 - 7. A module with an embedded card reader shall be installed in each entry panel to allow tenants to use proximity readers to access the building.
 - 8. A postal lock module shall be installed in each entry panel to allow postal workers to gain access to the building.
 - 9. Each entry panel shall be equipped with 120 volt to 24 volt power supply built-in, AC and DC door strike connections, Back box, Postal Lock connections, Door Timer Adjustment control, Volume control, Call Tone, Microphone, Color Camera and Speaker.
- D. Dwelling Unit Tenant Station:
 - 1. The dwelling unit tenant station shall be installed at the locations indicated on the drawings. The station shall be hands free, voice actuated, high resolution color monitor, tenant station with service button, Push-to-Talk feature unit that mounts to a two gang electrical box. All the switches shall be circuit board mounted to ensure long term reliability.
 - 2. All wiring between the entry panels and the tenant stations shall be solid 2/C#24 AWG conductors minimum for audio (Aiphone #872002) and solid 2/C#24 AWG conductors minimum for video (Aiphone #871802).
 - 3. Hearing Impaired dwelling units shall be equipped with a visual notification in each bedroom and living room to alert the tenant of a potential visitor through the use of externally activated relays. (Exact quantities shall be coordinated with the manufacturer)
- E. Electric Door Strikes:
 - 1. The electric door strikes shall be narrow style faceplate with a solid cast latch and heavy-duty latch spring. The electric strikes, faceplate, cast latch and case shall be corrosion resistant and capable of securing the respective door when power is de-energized.
 - 2. The strikes shall be solenoid actuated with push/pull linkage, heavy-duty wired leads and tamper resistant hardware.

2.34 DWELLING UNIT PHOTOELECTRIC SMOKE / CARBON MONOXIDE DETECTORS

- A. Dwelling Unit stand alone detectors shall have a nominal smoke sensitivity of 3.0% obscuration rate

- B. Each detector shall utilize an infrared LED sensing circuit, which pulses in 4 to 5 second intervals when subjected to smoke. After 2 consecutive pulses in a smoke condition, the detector will alarm.
- C. Each detector shall be equipped with a 9Volt DC alkaline battery as a back up in the event building power is lost.
- D. The 9-Volt DC battery impedance shall be verified by the integral circuit of the device.
- E. Each detector shall provide an indicator light when the battery is low in power or high impedance or if the battery is missing.
- F. Each detector shall provide a minimum of 5 to 1 signal-to noise ratio in the optics frame to assure stability of operation in environments of high Radio Frequencies and transient voltage conditions.
- G. The sensing chamber shall be fully screened to prevent entrance of small insects to reduce the probability of false alarms.
- H. Each dwelling unit detector shall be equipped with a solid state piezo alarm rated 90 db at 10ft and shall sound upon a smoke condition.
- I. Each detector shall have a visual LED monitor (condition indicator) that will slow pulse in normal operation and rapid pulse in alarm.
- J. An easily accessible test button shall be provided on each detector. The test button in the TEST position should simulate an actual smoke condition of approximately 3.5% causing the detector to alarm within 20 seconds. Each detector shall also have the capability of being tested down to 0.85% as a required minimum.
- K. Multiple dwelling unit stand-alone detectors shall be tandem wired up to 20 units or 6 units with auxiliary relays.
- L. Each device shall be UL 217 listed for both wall and ceiling mount.
- M. Each device shall also meet all requirements of the State of California Fire Marshall and the International Conference of Building Officials. All equipment shall be completely factory assembled, wired and tested, and the contractor shall be prepared to submit a certified letter testifying to this condition.
- N. Detectors that are located within a Dwelling Unit for the Hearing Impaired shall be equipped with a 110 candela strobe light.
- O. Detectors, which do not meet all of the requirements of this specification, will not be considered.
- P. The carbon monoxide (CO) portion of each device shall operate when a chronic CO level of 70 Parts Per Million (PPM) is detected. Upon activation of the device a red LED shall light and a built in 85dB @ 10 feet pulsating alarm shall sound.
- Q. Each detector shall be equipped with a reset button that will temporarily mute the audible alarm while the CO level is re-checked.
- R. If the CO level remains at 70 PPM or higher, the visual and audible alarm signal shall be reactivated. Once the area is properly ventilated the LED shall automatically reset to Green (power on) and the audible signal shall silence and the detection system shall reset itself.
- S. Each device shall be UL 217, UL 2034-2001, Listed and comply with NFPA 720 and listed for both wall and ceiling mount.
- T. Each device shall carry a Five Year Warranty and shall be manufactured by BRK or equal.

2.35 ADDRESSABLE/ANALOG FIRE ALARM SYSTEM

A. General Requirements:

1. Comply with Division 1, General Requirements and documents referred to therein.
2. Provide all labor, equipment, and materials to complete the Life Safety Fire Alarm System work in accordance with local and State Regulations.
3. Fire alarm system and components shall be listed to U.L. standard 864, 9th Edition and Manufactured by Notifier Company or FCI.

B. Description of System:

1. The Life Safety Fire Alarm Systems shall be an addressable, non-coded, electronically supervised, microprocessor based system. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using an integral service console or with a personal computer and specific system software.

2. Provide smoke, carbon monoxide, fire detection, sprinkler supervision, and automated single stage evacuation control. Interface to environmental controls and auxiliary devices.
 3. Provide signal appliances and signal controls for the safe and orderly evacuation of the building.
 4. The Life Safety Systems shall generally consist of the following main components:
 - a. control panel with 60/10 batteries
 - b. addressable devices
 - c. supervisory relays for sprinkler devices, etc.
 - d. auxiliary devices for door holder, etc.
 - e. audio visual devices
 - f. LCD type annunciator
 - g. framed graphic plan
 - h. exterior beacon
 - i. exterior sprinkler bell
 - j. bi-directional antenna system
 - k. 16 zone radio frequency master box
 5. Locate the main components and all related devices as shown on the Plans.
- C. Bi-Directional Antenna (BDA) system
1. This contractor shall be responsible for coordinating with the Fire Department a radio test that shall determine the signal reception at several locations on each floor of each building. Clear signal strength shall be required throughout each building utilizing the type of hand held radio unit used by the local fire department. Quantity of test locations shall be determined and conducted by a fire department representative. The minimum test points shall be determined by the following equation; (floor square footage / 25,000 sq.ft.) x 2. Additional specific test points may need to be considered in areas containing special wall construction or a large quantity of electromechanical building system equipment.
 2. Signal strength testing shall follow TXB-88 standards using Delivered Audio Quality (DAQ) measurements.
 3. A minimum signal strength of -95dBm (DAQ4) shall be available over 95% of each floor area requiring coverage when transmitted from the fire department.
 4. A minimum signal strength of -95dBm (DAQ4) shall be received at the fire department system from over 95% of each floor area requiring coverage.
 5. Frequency ranges shall be determined by the local fire department.
 6. BDA shall be Amp - TXXR Model 61-89-50-A18, UHF 80dB, 806-869 Bi-directional signal amplifier or approved equal.
 7. The amplifier shall be housed in NEMA 4 Weatherproof housing colored fire engine red and marked "Fire Dept. Radio"
 8. Above housing shall include a Locking Cabinet keyed alike with the other fire alarm devices and cabinets.
 9. Amplifier shall be complete with DC Power Revert and back up battery & charger
 10. TrippLite BP260; TrippLite 98-121; SC-49 Smart Charger
 11. Trilogy AT012R50 Riser Rated ½" 50 Ohm Coaxial cable shall be utilized for risers and Trilogy AQ012J50 Plenum Rated ½" 50 Ohm Radiating Coaxial cable for horizontal runs on each floor.
 12. Cable connectors shall consist of Trilogy Male/Female connector kits NMP01250 & NFP01250
 13. Comprod 362-75 806-960MHz Multi Band Antenna
 14. Maxrad MYA8066 800MHz Yagi Antenna
 15. The system manufacturer shall provide a wiring diagram and shop drawings of the exact system being proposed prior to any equipment being purchased. All equipment and wiring methods shall be approved by the local fire department and the engineer.
 16. Prior to the system being accepted, the contractor shall submit certification that the system is compatible with the local fire department radio system and field tests have been conducted to the satisfaction of the local fire department.
- D. Automatic Alarm Operations:

1. Operation of an addressable alarm input device shall flash the alarm signal, and annunciate on the alphanumeric LCD 80-character display. Display the type, condition, and a location message for the first alarm immediately without the need for operator response. Capture the display to annunciate an alarm. In the event the shared display is annunciating when events of a lower priority or the FACP is in the site-programming mode. Turn on a red alarm LED at the control panel.
 2. Sort new (subsequent) events by type and log into queues for display by emergency user selection. Sound a momentary audible signal for each event occurrence. Flash a queue LED when an unseen event exists in a queue. Update the display to annunciate the total by type and the chronological number of the event on display i.e. 3 alarm reports - #2 displayed.
 3. Activate the radio frequency masterbox to transmit the alarm signal to the fire department.
 4. Sound the evacuation signals throughout the building.
 5. Should a fire official choose to operate the Signal Silence button to silence the audio portion of the system, the control panel shall turn on an alarm silenced LED while the signals are in the silence mode. Should a new alarm occur after signal silence, all the alarm devices shall re-sound.
 6. Air Handling Unit smoke detectors when activated shall shutdown the respective unit and all associated smoke and fire dampers. The exact location of all remote test stations shall be coordinated with the local fire department.
 7. Upon activation of elevator lobby smoke detectors, elevator machine room smoke detectors and/or elevator shaft smoke detectors the respective elevator shall home to the main level. Once the elevators have reached the main level the elevator doors shall open and remain open until the system has been reset. If the main level is in alarm, home the elevators to an alternate floor designated by the local fire department.
 8. Upon activation of a system connected carbon monoxide detectors, a supervisory signal shall be sent to a UL Approved central station monitoring company via the digital communicator specified herein. This signal transmission shall be in accordance with NFPA 720, "Standard for Installation of Carbon Monoxide Warning Equipment in Dwelling Units 2005 Edition" and the 8th edition of the Massachusetts State Building Code.
 9. De-energize door holders to release all fire doors.
 10. Elevator machine room and elevator hoist way smoke detectors when activated shall start the hoist way exhaust fan and open the hoist-way louver to ventilate the shaft. And shunt trip the elevator power.
 11. The contractor shall provide a time delay on the main flow switch to allow time for a subsequent flow switch to alarm first and annunciated at the FACP. This shall be coordinated with the local fire department.
- E. Non-emergency User Operations:
1. Fire Alarm Control Panel (FACP) shall be equipped with full QWERTY keypad, Acknowledge/Signal, Silence/System, Reset/Drill switches, Automatic time control functions with holiday exceptions and Boolean logic equations.
 2. Log a trouble and turn on a System Trouble LED for all user features, which modify, bypass, or inhibit the normal operations of the fire alarm life safety system. Suppress the common trouble signal during delivery of alarm signaling.
 3. On the LCD, CPU, operation of the display ID code key shall annunciate the point identification address and description of the currently displayed device.
 4. Operation of the menu key shall call a smart prompt program to guide the user through LCD, CPU programming operations. Restrict the use of this program by password.
 5. Operation of the Reset/Drill Switch shall return the system to normal after all initiating devices have been returned to normal.
- F. Supervisory Operations:
1. Operation of an addressable supervisory input device shall flash the supervisory queue indicator, sound a momentary audible signal, and display on the alphanumeric shared display.
 2. Display the type, condition, and a location message for the first alarm immediately without the need for operator response if no fire alarms are present.

3. Log subsequent supervisory events in the supervisory queue for display by emergency user selection. Also, display the current total number of supervisory events and the chronological number of each event.
 4. Provide supervisory alarm priority to capture the display from a trouble or monitor event.
 5. Turn on a respective amber group individual zone LED at the control panel and activate the digital communicator.
- G. Quality Assurance:
1. Install in accordance with the NFPA and the National Electrical Code.
- H. Submittals:
1. Submit Shop Drawings for the control panel and all devices.
 2. Submit custom operational sequences for the emergency communications, peripheral devices and fire alarm controls.
 3. Submit pictorials or photographs of control equipment overviews, modular components, and interconnecting cable charts.
 4. Provide system manuals, maintenance instructions and the name, address, and 24-hour telephone number of the service department of the SYSTEM SUPPLIER.
 5. The Electrical Contractor shall provide as-built floor plans showing all devices, control panel, and connections to mechanical equipment. Drawings shall show all conduit routing and sizes, all wire sizes, types, and numbers.
- I. Replacement of Defective Items:
1. Supply to the Architect a written agreement from the equipment manufacturer to supply new components to replace defective items without cost to the Contractor, where such defective items become evident during a period of one year from the approved certificate of completing.
- J. Control Panel:
1. Provide fire alarm control panel in accordance with U.L. and N.F.P.A. requirements. Control panel shall be Notifier NFS2-640.
 2. The system shall be housed in a surface wall mounted cabinet with a door and viewing windows as required. All annunciator indications, operating controls and instructions shall be clearly visible through the viewing window. The door shall be complete with a lock and two keys.
 3. All electrical connections shall be front accessible through the hinged inner door.
 4. The service console shall provide system activity LED's and event buffer display.
 5. The single person installation verification test shall allow silent and non-silent testing of all system components. In addition, it shall produce a detailed report listing relay and signal programming for each verified input.
 6. Provide the ability to field program on the panel or with the use of a personal computer equipped with system specific software. The software shall allow a qualified service technician to perform multiple level programming, detailed system diagnostics and print system summary reports. The FACP shall have an 80 column printer interface and two (2) USB ports.
 7. Control panel shall be provided with a Radio Frequency shield to prevent interference and/or failure when fire fighting personal key two way radios when in close proximity to the FACP.
- K. 16 Zone Radio Frequency Alarm Transceiver
1. The wireless, two-way radio transceiver shall provide two-way alarm transmission from each building to the fire department receiver. The transceiver shall be 16 zones and manufactured by Signal Communications #DTXH3R2-N1R16 and shall be UL and FM listed for primary signaling.
 2. Each transceiver shall be equipped with battery back-up built into the unit, omni-directional 7db antenna, 4.0 watt UHF and VHF transceiver, A controller that will repeat alarms, repeat trouble, low battery, AC status, battery charger and will operate in the range of -40 to 150 degree F.
 3. Each zone shall have a display light for both Trouble and Alarm
 4. Each unit shall (4) command / control Form C relays. These relays shall be rated 2A @ 30 Volts DC , 0.4A @125 volts AC and be capable of being programmed.

5. Each unit shall comply with UL 9th Edition, UL 1610 Central Station Alarm Units, UL864 Control Unit Accessories and be Factory Mutual approved.
 6. Each unit shall have a frequency range of 162-174 MHz, primary power of 120 volts, DC power of 24 volts, 12 volts, 7 amp hour battery and a minimum of 72 hours of battery back-up capability with a fully configured system.
 7. Exact identification of zones shall be coordinated with the fire department.
- L. Signaling Line Circuits
1. The FACP shall be provided with two (2) Signaling Line Circuits (SLC), style 4, 6 or 7. Each SLC shall be capable of monitoring 159 detectors (any combination of; ionization, photoelectric, thermal or multi-sensor devices) and 159 addressable modules (pull stations, normally open contact devices, two-wire smoke detectors, notification appliances, or relays) per SLC. 318 devices per loop, 636 devices per FACP.
 2. Connect SLC's to a Loop Controller. Use solid, twisted pair, type FPLP wire in a metallic sheath with a red stripe. Connect SLC's, Class A style. Class B wiring shall not be acceptable.
 3. Each SLC shall have a ground fault LED in the FACP to monitor the circuits for ground faults.
 4. Each addressable device shall have a unique address. The manufacturer shall program each address and correlate them to output operations per the Plans and this Specification. Non-functioning, non-addressed and non-programmed devices shall report trouble. FACP shall provide for site modification to the addressable programming. The system shall provide for removal of devices without the necessity of re-addressing any other devices. Provide installation flexibility to the contractor by insuring that the physical sequence (placement) of the devices on the loop need not determine the device address.
 5. Address and connect, addressable alarm receiving devices to the addressable loop as recommended by the manufacturer. Devices on each SLC shall be polled in less than two seconds and activate in less than five seconds. The manufacturer shall provide installation tables to identify all device addresses.
 6. Connect each normally open sprinkler supervisory device to a dedicated addressable transponder. Annunciate each supervisory addressable input device alarm or trouble operations on the LCD. Provide an individual status description on the LCD for each supervisory device.
 7. Connect each normally open Carbon Monoxide detector to a dedicated addressable transponder. Annunciate each supervisory addressable input device alarm or trouble operations on the LCD. Provide an individual status description on the LCD for each supervisory device.
 8. Provide circuits to monitor auxiliary devices such as smoke dampers and fan operation as shown on the Plans. Annunciate open or shorts as required. Provide an individual status description on the LCD for each circuit and display a message on the LCD.
- M. Notification Appliance Circuits (NAC):
1. All NAC's shall be power limited, supervised circuits, field programmable for any of the following operations:
 - Audible or Visual signals controlled by signal silence.
 - Audible or Visual signals controlled by system reset.
 - Remote auxiliary devices, which DO or DO NOT operate in the degraded mode. This shall be determined upon field requirements and be selectable during programming.
 2. The FACP shall be equipped with a six (6) amp switch mode power supply with four Class A or B, built-in NAC circuits. All audio/visual devices shall be synchronized and field selectable as specified herein.
 3. The system manufacturer shall provide, as necessary, auxiliary power supplies. The auxiliary power supplies shall provide power limited, supervised circuits for audio/visual devices. All auxiliary power supplies shall have built-in batteries and a charging circuit. Auxiliary power supplies shall be powered from a 120 volt dedicated power source. Exact quantity of auxiliary power supplies shall be coordinated with system manufacturer.
- N. Auxiliary Relays:
1. Auxiliary relay module shall be provided with four, type "1C" site programmable relays.

2. Provide auxiliary relays with switches and status descriptions on the LCD for control functions as listed in the operations and as shown on the Plans. Relays shall be dust tight with fuse protected contacts rated at 24 VDC/120 VAC, 2.5amps. Inductive at a 35 power factor. Each relay will have a follower LED which verifies operation of the relay.
- O. Central Station Connection:
1. FACP shall be provided with an eight channel, 636 point dual line digital communicator with built-in battery back-up. The contractor shall provide two dedicated telephones to an EIA-485 terminal block built into the FACP.
 2. Communicator shall be UL listed and comply with NFPA 72 A, B, C, standards.
 3. Program the communicator to operate upon activation of any supervisory condition and contact a UL Approved central station monitoring company. Re-transmission shall be in accordance with the 7th edition Massachusetts State Building Code and a witness test shall be provided before the system is approved.
- P. Fire Alarm Common Controls and CPU:
1. Common control/CPU shall be self-configurable and able to map to the display module by I/O module type. It shall have built-in field programmable software capable of being programmed and configured on site using either the built-in service console or a personal computer with system specific software. The computer shall be capable of connecting to the USB ports.
 2. Provide a LCD CPU/Common Control Central Processing Unit with a 2 line 80-character LCD display and switches for common control, programming functions and alarm displays.
 3. Universal Display modules shall connect to the CPU and provide all point identification and/or control functions.
 4. Provide the following indicators: Power ON LED, Signals Silenced LED, Point Disabled LED, System Trouble LED, Supervisory LED, Security LED, Pre-Alarm LED, Fire Alarm LED, NAC #1 LED's, NAC #2 LED's, NAC #3 LED's, NAC#4 LED's, SLC #1 Ground Fault LED, SLC #2 Ground Fault LED and Earth Fault LED.
 5. Provide the following keypad switch controls; Ground fault detection Enable/Disable, Disable/Enable switch for back-up alarms for (4) NAC's, Acknowledge/Scroll Display switch, Signal Silence switch, Drill switch, Reset switch and Lamp Test switch.
 6. The Liquid Crystal Display (LCD) shall be of the super twist high contrast characters. Provide non-interleaving event display by type sorting input events into queues. Types shall be fire alarm, supervisory alarm, trouble, and monitor. Provide a full alpha numeric 80 character (2 x40) display to support site programming. Initiate a trouble signal if programming input is incomplete.
- Q. System Supervision:
1. Hardware or software fault detection shall activate the audible and visual trouble indicators. Operation of the silence push shall silence the audible signal, but the LED shall remain on. A new fault shall resound the signal. It shall not be possible to turn off the trouble LED until the system is clear of all faults. The common trouble circuit operation shall be independent of the CPU.
- R. Trouble Reporting:
1. All by-pass conditions such as auxiliary or fire department by-pass.
 2. All wiring to all fire alarm devices.
 3. Power connections and data transmissions.
 4. All control panel hardware for placement.
 5. All software routines and all program data for change.
 6. All volatile memory for failure.
 7. Primary and secondary power.
 8. All field wiring for ground faults.
 9. Maintain a record in memory of fault events.
 10. Identify faults by code to simplify service trouble shooting. Standard system reset shall not erase this record.
- S. System Power:
1. Provide primary operating power of 120 Volts A.C. 60 Hz. Use modular no break system power supplies with integral battery chargers capable of recharging within 12 hours.

2. Provide supervised secondary battery power to operate the entire system for 60 hours under normal conditions. At the end of 60 hours, the standby source shall power the system under alarm conditions for 10 minutes.
- T. System Protection:
1. Provide high voltage transient protection all circuits. Minimum protection shall be 1000V for alarm receiving, 1500V for signaling, and 2500V for power supplies.
 2. Protect sensitive electronics subject to static damage. Installer access to areas with static sensitive parts shall not be necessary.
 3. Protect controls and annunciation behind locked doors all keyed alike. Provide door windows to allow viewing of all common controls and system annunciation.
- U. Addressable Devices:
1. Provide input devices such as manual stations, smoke detectors, duct smoke detectors carbon monoxide detectors and heat detectors with built-in addressable transponders. Set a unique address at each device.
 2. For heat detectors with fixed temperature ratings higher than 135 F, provide separately mounted transponders outside of, or away from the high heat areas.
 3. Provide separately mounted transponders for other input devices such as:
 - sprinkler flow
 - sprinkler supervisory
 - low pressure switches
- V. Flow and Tamper Switches:
- Flow and Tamper Switches shall be furnished and installed under division 15, wire by the Electrical Contractor. Provide Monitor module for each of these devices for addressability to FACP.
- Tamper switches shall be wired such that upon activation, a supervisory signal is sent by the control panel to a U.L. approved central station monitoring company via a built-in dual line digital communicator.
- W. Addressable Pull Stations:
1. Manual Fire Alarm Stations shall be non-coded, dual action type pull station. The pull stations shall be capable of being opened without causing an alarm condition. An operated device is when the handle latches in the down position and the word "ACTIVATED" appears. This is the indication that the station has been operated. Each station shall be equipped with a built-in bicolor LED, which shall be visible through the handle of the station. The LED shall flash during normal operation and shall latch steady, RED when in alarm. Manual stations shall be constructed of molded durable Lexan with a textured finish. Stations shall be suitable for surface mounting on matching back box, or semi-flush mounting a standard single gang box and shall be installed not less than four and one-half feet above the finished floor. Manual stations shall be Underwriters Laboratories Listed. Provide an addressable monitor Modules with each station. Manual station shall comply with ADAAG guidelines for controls and operating mechanisms (Section 4.1.3, 13) and meet ADA requirements for 5 pounds maximum activation force. Each device shall be equipped with a Category 30 key operated reset.
- X. Addressable Photoelectric Smoke Detectors:
1. The Contractor shall install, where indicated on the Plans, plug-in, two-wire intelligent Analog / Addressable Photoelectric type smoke detectors and matching bases. The detectors shall be the self-verification type and have integral analog communications, built-in type identifications, and two blinking LEDs. The LEDs shall blink each time the device is addressed, and shall be continuously illuminated when the detector is in alarm. The addressing switches shall be located in the detector bases which shall be directly connected to an SLC for two-way communication with the FACP. The bases shall accommodate matching ionization and thermal detectors. The bases shall be capable of mounting to outlet or device boxes and have provisions for surface mounting. The detectors shall have a built in test switch and shall be capable of remote testing from the FACP. Devices with addressable switches or settings in the heads shall not be accepted.
- Y. Addressable Heat Detectors:

1. The Contractor shall install, where indicated on the Plans, plug-in, two-wire intelligent Analog/Addressable fixed temperature heat detectors and matching bases. The detectors shall be continuously monitored to measure any change in their sensitivity due to temperature and have integral analog communications, built-in type identifications, and two blinking LEDs. The LEDs shall blink each time the device is addressed, and shall be continuously illuminated when the detector is in alarm. The addressing switches shall be located in the detector bases which shall be directly connected to an SLC for two-way communication with the FACP. The bases shall accommodate matching smoke detectors. The bases shall be capable of mounting to outlet or device boxes and have provisions for surface mounting. The detectors shall have a built in test switch and shall be capable of remote testing from the FACP. Devices with addressable switches or settings in the heads shall not be accepted.
- Z. Addressable Carbon Monoxide Detectors:
1. The Contractor shall install, where indicated on the Plans, plug-in, two-wire intelligent Carbon Monoxide detectors and matching bases. The detectors shall be continuously monitored and fully listed to UL Standard 2075. Each detector shall be equipped with a trouble relay, which sends a sensor failure or end-of-life signal to the control panel and the central station via the digital communicator.
 2. If a detector senses carbon monoxide it shall alert by sounding and flashing a temporal -4 signal pattern. Each carbon monoxide detectors shall be addressed, and shall be provided with dual color LED (green for normal/standby and red for alarm) indication, which blinks 1 per minute, to indicate normal standby, alarm, or end-of-life. When the sensor supervision is in a trouble condition, the detector shall send a trouble signal to the FACP. When the detector gives a trouble or end-of-life signal, the detector should be replaced.
 3. Each detector shall be provide with a mini monitor module shall fit in a standard single gang box located above the detector it is monitoring. The addressing dials shall be located as part of the mini monitor module which shall be directly connected to an SLC for two-way communication with the FACP. The detectors base shall be capable of mounting to a standard single gang outlet or device boxes and have provisions for surface mounting. The detectors shall have a built in test switch and shall be capable of remote testing from the FACP.
 4. Each carbon monoxide detector shall be in full compliance with UL 2075, be equipped with a trouble relay, electromechanical sensing technology and supervised wiring shall be accomplished with Phillips head SEMS screw terminal connections.
 5. Carbon monoxide detectors shall be manufactured by Notifier (#N-MMCO).
- AA. Signal Appliances:
- Strobe Units

Use red wedge shaped strobes clearly labeled "FIRE" in white letters. Polarize the strobes for supervised operation. Strobes shall provide a high intensity flashing light for visual signaling. Strobe units shall mount surface or flush as indicated on the plans and mount to a standard 4" x 2 1/8" back box with no extension ring required. Strobe Units shall be synchronized and comply with ADA and be UL approved. All strobe units shall be field selectable on the front of the unit with Multi-Candela settings of 15/30/75/110 candela.
 - Signal Horn/Strobes

Provide red units with white letters clearly labeled "FIRE". Each device shall produce a minimum of 75 Candela with a Xenon Strobe Light and an audible signal that will produce not less than 87 dba sound output. Horn/Strobe devices shall be synchronized and comply with ADA and be UL approved. Mount devices flush or surface as indicated on the plans and mount to a standard 4" x 2 1/8" back box with no extension ring. All horn/strobe units shall be field selectable on the front of the unit with Multi-Candela settings of 15/30/75/110 candela and have at least two (2) selectable horn tones and three (3) decibel settings.
 - Mini Horns

Provide units with an audible signal that will have not less than 87 dba sound output at 24 volts DC. Mount flush or surface as indicated above. Mount devices flush or surface as indicated on the plans and mount to a standard 4" x 2 1/8" back box with no extension ring. All horn units shall have at least two (2) selectable horn tones and three (3) decibel settings.

BB. Auxiliary Devices:

1. Provide remote control relays connected to supervised auxiliary circuits for control of fans, dampers, door releases, etc. Relay contact rating shall be 5 amperes at 120 VAC resistive or 2.5 amperes at 120 VAC inductive for a .5 power factor.
2. Provide flush wall mounted electromagnetic door holders. Holders shall mount to a standard single gang outlet box. Holders shall be rated 24V DC and shall release upon activation of the fire alarm system.
3. Beacon, provide a 24 VDC exterior Weatherproof Beacon constructed with a Lexan lens a heavy duty xenon strobe lamp. Beacon shall be similar to Amsec SL-5 or equal.

CC. Installation:

Install manual pull stations as indicated and connect to an SLC. Mounting heights shall be as indicated on the drawings. Install automatic alarm and initiating devices as indicated and connect to SLC's. Mounting heights and locations shall be as indicated on the drawings and coordinated with the local Fire Marshall.

Install duct detectors and Remote Test Stations in HVAC equipment as indicated on the drawings. Mount duct smoke detectors at a suitable location in the supply air duct work of units 2000 cfm or greater. In units that are rated 15,000 cfm or greater, duct smoke detectors and remote test stations shall be installed in both the supply and return air streams of the unit. Mounted duct detectors in a readily accessible location for maintenance.

Install audible signal devices as indicated and connect to NAC's. NAC wiring shall be suitable for Class II.

Connect door holders to the fire alarm system such that the designated doors release upon activation of the fire alarm system.

All fire alarm wiring shall be plenum rated Power Limited Fire Alarm cable with solid conductors. The contractor shall be responsible for the supply and installation of the cable, wire, wire pulling, junction boxes, electrical boxes, and terminal cabinets in accordance with the manufacturer's recommendations but shall be no smaller that what is indicated on the drawings. The manufacturer shall allow for the necessary amount of onsite assistance for the contractor during the construction period.

BB. Verification and Certification:

The manufacturer shall make an inspection of the Life Safety equipment. The inspection shall include all equipment necessary for the direct operation of the system such as input and output devices. Verify wiring connections to ensure that all equipment meets applicable codes and standards. Verify equipment supplied by the manufacturer has been installed per the manufacturer's recommendations. Verify the operation of all devices. Verify the wiring to all supervised devices is supervised.

PART 3.00 – EXECUTION

3.01 GENERAL PROVISIONS

- A. All locations of equipment and materials are subject to review by the Architect in order to coordinate with field conditions.

3.02 TESTS

- A. The right is reserved to conduct acceptance tests of all equipment wiring or any other work furnished under these Drawings and/or Specifications to determine the fulfillment of specific requirements and/or design.
- B. The Electrical Contractor shall conduct all such tests in the presence of authorized representative of the Owner and at such times that the Owner may designate.
- C. The Contractor shall perform all tests, supply all instrumentation, personnel and make all adjustments of equipment and wiring as may be necessary. Insulation resistance readings of all equipment and circuits shall be taken by the Contractor in the presence of the Owner's representative. Megger readings of less resistance than the recommended minimum as called by Section 110-7 of the NEC shall be required or replaced by this Contractor at no cost to the Owner.

3.03 GROUNDING

- A. The Contractor shall furnish and install all material required for grounding and/or bonding in the building of all equipment, power systems, all as shown on the Drawings and/or specified, as a minimum.
- B. Grounding shall conform to NEC Article 250.

3.04 INSTALLATION OF WIRING AND CONDUIT

- A. In general, all wiring is to be run concealed unless otherwise indicated to be run exposed. Exposed wiring in the mechanical spaces is acceptable.
- B. Raceways shall be continuous from outlet to outlet and from outlets to cabinets, junction and pull boxes, and shall enter and be secured to all boxes in such manner that each system shall be electrically continuous from service to all outlets. Terminal of all conduits shall be furnished with double locknuts and bushings.
- C. Exposed conduits shall be run parallel to or at right angles to the wall of the buildings, and all bends shall be made with standard ells or bent to not less than the same radius. Horizontal runs of exposed conduits shall be close to ceilings, passing over water or other piping where possible and shall be supported by pipe straps or by other approved means, not more than five feet apart.
- D. In no place shall conduit be run within six inches of hot water pipes or appliances, except where crossing is unavoidable, and in that case the conduit shall be kept at least one inch from covering of pipe crossed.
- E. Conduits shall be supported on approved types of galvanized wall brackets, ceiling trapeze, strap hangers or pipe straps, secured by means of toggle bolts on hollow masonry, machine screws on metal surfaces or wood screws on wood construction. No nails shall be used as a means of fastening boxes or conduit.
- F. In general, no splices or joints will be permitted in feeder cables, and branches shall be spliced at outlets or accessible junction boxes.
- G. All splices in wire #6 AWG and smaller shall be standard pig-tail made mechanically tight, then cleaned, and insulated with proper layers and thickness of rubber and friction tape. Wire splicing nuts, Thomas and Betts, Sta-Kon or Minnesota Mining and Manufacturing Co., Scotchlock Type R, may be used subject to approval of the local inspector. Joints, tape and splices in wire #6 AWG and larger shall be taped with approved rubber and friction tapes providing insulation not less than that of the conductor over Burndy Servits or equivalent connectors made by Penn Union or Blackburn.
- H. Wire #6 AWG and larger shall be connected to panels and apparatus by means of approved lugs and connectors. Connectors shall be solderless type, sufficiently large to enclose all strands of the conductor and securely fastened.
- I. Non-Metallic Sheath cable shall be supported by staples, cable ties, straps or approved method so designed and installed as to not cause damage to the cable. Cables shall be secured at intervals not to exceed 4 ½" on center and within 12" of every cabinet box or fitting.
- J. Wiring method shall conform to local wiring inspector. Prior to submitting bid, Contractor shall confirm wiring method to be allowed by local ordinances.

3.05 INSTALLATION OF OUTLET BOXES

- A. Outlet boxes shall be of size and type to accommodate structural conditions; size and number of raceways; conductors or cables entering; and device or fixture for which required.
- B. Install blank plates on all outlet boxes in which no apparatus is installed, which do not integrally provide a cover for box.
- C. Special care should be taken to set all boxes correctly, square and true with the building finish. The edge of the box shall come flush with the building finish. As far as possible, all wall and switch outlets shall be erected in advance of furring and fireproofing and shall be secured to the building structure or steel by adjustable strap iron supports, which shall be buried.
- D. The exact location of all outlets and switches in finished rooms shall be obtained from the Architect and from the scale drawings of interior details and finish. Final correct readjustment shall be made to outlets, if necessary, to give proper centering.
- E. The locations given or designated on the Plans for the outlets are subject to notifications. In the case of local wall switches to be set at or near doors, the definite location shall be as established on the side of the door opposite the hinge.

3.06 JUNCTION AND PULL BOXES

- A. Junction and pull boxes shall be furnished and installed under this Section of the Specification where indicated on the Drawings and wherever else such a box may be deemed necessary to facilitate the pulling or splicing of wire and cable.
- B. All such boxes must be made accessible and shall be built only from the approved detail working Drawings. Conduits shall enter these boxes through tight-fitting clearance holes.
- C. The covers of the boxes shall be designed for quick removal. Where junction boxes are required for a splicing box for special recessed fixtures, consult the Architect before installing boxes for these fixtures and determine the exact location of the boxes.
- D. Each feeder passing through a pull box shall meet the approval of the Architect. Generally, junction boxes and pull boxes shall not be exposed in finished areas; where necessary, reroute conduits or make other arrangements to meet the approval of the Architect.
- E. Outlet, pull and junction boxes shall be properly sealed during the course of construction to prevent the entrance of dirt and foreign materials within same or the raceway system of which it is part. The Electrical Contractor shall provide temporary covers for all open boxes. Paper may be solidly packed into standard work boxes to prevent the entrance of dirt and foreign materials, in lieu of cover plates if so elected by the Electrical Contractor.

3.07 LIGHT SWITCHES

- A. In general, convenience outlet circuits shall be independent of light circuits. In all cases the light switches shall be located opposite hinge side of door, per latest Architectural Drawings

3.08 GENERAL PANEL INFORMATION

- A. All panels shall be properly balanced, the circuit numbers on the Plans being a numerical indication rather than any attempt to indicate proper balance.
- B. Care shall be taken in the use of a common neutral to make certain that no more than one leg is taken from each phase.
- C. Typed directories shall be provided in each panel indicating circuit number and the outlets or items controlled or fed from same.

3.09 MOTOR WIRING

- A. The Contractor shall do all wiring required for plumbing, ventilating and heating motors including mounting of switches and starters, as well as wiring of same. All wiring for the control of motors, unless indicated on Electrical Plans, shall be indicated in HVAC, Plumbing and Fire Protection Sections.

- B. The Contractor shall furnish and install starters and fused disconnecting means as required by the National Electrical Code for all motors. Motor-driven equipment specified under "Plumbing" and "Heating and Ventilating" may be factory wired complete with controller and motor disconnects; therefore, the Contractor should check equipment purchased under these divisions so as to avoid duplication of protective and disconnecting means. Motor disconnects shall be fused unless noted otherwise. Single phase disconnects may be thermal switches.
- C. The Contractor shall furnish and install a fused disconnect at each HVAC unit. Fusing shall be per manufacturer's recommendation. Prior to wiring HVAC units, Contractor shall review submittals on equipment for electrical characteristics.

3.10 VOICE/DATA SYSTEM

- A. Contractor shall furnish and install a fire rated plywood backboard for telephone equipment as indicated on the drawings.
- B. Contractor shall furnish and install raceways from the main voice/data room on the first floor to each satellite data closet in the building as indicated on the drawings. The exact location of the conduit system shall be determined in field and as shown on the Plans.

3.11 FIRE ALARM SYSTEM

A. INSTALLATION

1. Fire alarm system shall be wired in accordance with manufacturer's complete Wiring Diagram as submitted with Shop Drawings.
2. Power limited, solid, plenum rated fire alarm cable shall be utilized for wiring system components associated with the data loops. #14 solid conductors shall be utilized for signaling circuits.
3. Provide two complete Wiring Diagrams and maintenance manuals to be turned over to Owner. Provide one additional Wiring Diagram and maintenance manual in control panel.
4. Entire system shall be guaranteed for one year after final acceptance.
5. Provide and install the system in accordance with the Plans and Specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of NEC-Article 760 A and C, Power-Limited Fire Protective Signaling Circuits or if required, may be reclassified as non-power limited and wired in accordance with NEC-Article 760 A and B. Upon completion, the Contractor shall so certify in writing to the Owner and General Contractor. All junction boxes shall be painted red and labeled "Fire Alarm". Wiring color code shall be maintained throughout the installation.
6. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate Subcontractors.
7. The Contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.
8. The manufacturer's authorized representative shall provide onsite supervision of installation.

B. TESTING

1. The completed fire alarm system shall be fully tested in accordance with NFPA-72H by the Contractor in the presence of Owner's Representative and the Local Fire Marshall. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner and General Contractor.

C. WARRANTY

1. The Contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one year from the date of first beneficial use.

2. The equipment manufacturer shall make available to the Owner a maintenance contract proposal to provide a minimum of two inspections and tests per year in compliance with NFPA-72H guidelines.

D. GENERAL

1. The work covered by this Section of the Specifications includes the furnishing of all labor, equipment, materials, and performance of all operations in connection with the installation of the Fire Alarm System as shown on the Drawings and as herein specified.
2. The requirements of the conditions of the Contract, Supplementary conditions and General Requirements apply to the work specified in this Section.
3. The complete installation shall conform to the applicable sections of NFPA-72 (A), (B), (C), (D), (E), (F), Local Code Requirements and National Electrical Code with particular attention to Article 760.
4. The work covered by this Section of the Specifications shall be coordinated with the related work as specified else where under the project Specifications.

E. QUALITY ASSURANCE

1. Each and all items of the fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listing shall not be acceptable.
2. In addition to the UL-UOJZ requirement mentioned above, the system controls shall be UL listed for Power Limited Applications per NEC 760. All circuits must be marked in accordance with NEC Article 760-23.

3.12 FIRE ALARM INSPECTION AND TESTING CONTRACT

- A. Prior to making the final connections to the Municipal Alarm System, a Contract must be in evidence between the person holding title to the interior fire alarm system and the holder of a certificate of competency as a fire Alarm Systems Contractor from the Local Fire Department, who will be responsible for the inspection, testing and maintenance of the interior fire alarm system and the Master Fire Alarm Box.
- B. Each manual station or transmitter shall be tested at least twice a year. During bi-monthly test of each system, at least one alarm initiating device shall be tested in each alarm circuit. A report of each month's test shall be forwarded to the Superintendent of Fire Alarm, Local Fire department.
- C. All detectors associated with an interior fire alarm system shall be tested once every twenty-four (24) months, with one-twelfth the number being tested in each monthly test.
- D. Self-restoring detectors shall be exposed to either heat or smoke to test their ability to initiate an alarm.
- E. Fusible link type detectors shall be unscrewed from their holders to test their ability to initiate an alarm. Every six months one (1) fusible link shall be exposed to heat to test the ability of the fusible link to respond to heat.
- F. Bi-monthly test reports shall include the following information;
 1. Date of Test
 2. Name and location being tested
 3. Master Fire Alarm Box number
 4. Number of interior alarm circuits
 5. Number of devices tested and type
 6. Condition of emergency standby power supply
 7. Name of company conducting test
 8. Name and signature of person conducting test
- G. The testing agreement will cover;

1. Damage resulting from accidents, fire, storm, water, negligence, misuse, vandalism, and defective or improper wiring.
 2. Testing of overflow switches on sprinkler system (waterflow switches to be tested by sprinkler company personnel).
 3. Testing or repairs of door release mechanisms covered in another section of the hardware contract.
 4. Testing or repairs of dampers, smoke hatches, elevator controls, or other peripheral equipment nor furnished by the fire alarm manufacturer.
- H. The Electrical Contractor shall furnish and install in accordance with manufacturer's instructions all wiring, conduit, and outlet boxes required for the erection of a complete system as described herein and as indicated on the Drawings.
- I. All wiring shall be as indicated above, and shall meet the requirements of all National, State, and Local Electrical Codes. The sizes of the different wires shall be as specified by the manufacturer. Color code shall be used throughout. All wires shall be tagged at all junction points and shall test free from grounds or crosses between the conductors.
- J. Final connections between the control equipment and wiring system shall be made under direct supervision of a representative of the manufacturer.

3.13 QUIET OPERATION

- A. ***All equipment and material furnished by this Contractor shall operate under all conditions of load without objectionable noise or vibration, which in the opinion of the Architect is objectionable. Where sound or vibration conditions occur, which the Architect considers objectionable, this Contractor shall eliminate same in a manner approved by the Architect.***

3.14 RECORD DRAWINGS

- A. A set of as-built Record Drawings, consisting of a reproducible set of Architect's Drawings with additional sketches as required, denoting and dimensioning accurately all changes in elevation location and size of material deviating from the Architect's Drawings, shall be kept concurrently with the progress of the installation. Upon completion of the work, the Contractor shall deliver to the Architect an up-to-date set of these as-built Record Drawings.

3.15 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

- A. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Architect prior to the installation of same. The Electrical Contractor shall submit to the Architect, via the General Contractor the location where he proposes to use supplementary steel and channels, for the support of equipment, fixtures and raceways. The submittal shall indicate the mounting methods, size, and details of the supports, channels and steel. It shall indicate also the weight, which the supports, channels and supplementary steel are to carry.

SECTION 31.23.16

ROCK EXCAVATING AND DISPOSAL

<u>PART 1</u>	<u>GENERAL</u>
16.01	SCOPE OF WORK
16.02	RELATED WORK SPECIFIED ELSEWHERE
16.03	ROCK EXCAVATION - GENERAL
16.04	ROCK BLASTING
16.05	EXPLOSIVES
16.06	BLASTING RECORDS
16.07	EXCESS ROCK EXCAVATION
16.08	SHATTERED ROCK
16.09	BACKFILLING ROCK EXCAVATIONS

<u>PART 1</u>	<u>GENERAL</u>
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16.01	SCOPE OF WORK
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- A. Work under this section consists of furnishing all labor, tools, equipment and supervision necessary to excavate rock, if encountered, to the lines and grades required to install the pipe as indicated on the Contract Drawings. The Contractor shall dispose of the excavated material for backfill in place of the excavated rock.
- B. In general, rock in trench shall be excavated so as to be not less than 6 in. from the pipe after it has been laid. Before the pipe is laid, the trench shall be backfilled to the correct subgrade with thoroughly compacted, suitable material or when so specified or indicated on the drawings, it shall be backfilled with the same material as that required for bedding the pipe and will be furnished and placed at the expense of the Contractor.

16.02	RELATED WORK SPECIFIED ELSEWHERE
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- A. DIVISION 31 – EARTHWORK

<u>PART 3</u>	<u>EXECUTION OF WORK</u>
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16.03	ROCK EXCAVATION - GENERAL
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- A. “Rock” shall be classified as a material which requires for excavation drilling, blasting, or breaking by means of power tools. Boulders and concrete structures one cubic yard or greater, however removed, are included within this definition of rock. When material is encountered with respect to which the Contractor may claim removal as rock excavation, such material shall be uncovered and exposed and the Engineer notified by the Contractor before proceeding with the excavation. The Contractor shall not proceed with the excavation of the material to be removed as rock excavation until this material has been cross-sectioned and classified by the Engineer. Failure on the part of the Contractor to uncover such material, notify the Engineer, and allow time for cross-sectioning the undisturbed surface of such material, will forfeit the Contractor’s right of claim to any classification other than that allowed by the Engineer for the areas of work in which the deposits occur. Rock excavation shall be considered unsuitable backfill material and shall be used for ditch and slope protection or wasted off-site as directed by the Engineer.

16.04	ROCK BLASTING
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- A. The Contractor shall inform the Engineer, the Owner and field representative if blasting is required. No blasting operations shall be performed without written approval from the Engineer, Owner .
- B. If blasting is required and allowed, it shall be done in a safe manner by a licensed blaster, and the Contractor shall take all precautions necessary for the protection of persons and property. Extreme care shall be exercised in the handling and use of explosives. No blasting work shall be performed without permission from all governing authorities and the Engineer. Any blasting work approved as necessary shall be done in accordance with all applicable safety regulations including all State and local regulations. Ample warning shall be given for all blasts, and adequate means taken to prevent all persons from entering the blasting area. Experienced personnel shall do all blasting operations. The Contractor shall be entirely responsible for any blasting operations and the results therefrom. Any damage caused by blasting shall be corrected by the Contractor at no additional expense to the Owner.
- C. Prior to conducting any blasting, the Contractor shall prepare, and submit to the Engineer for review, a description of the blasting procedures which the Contractor proposes to use on the various segments of the work. The Contractor shall measure vibration from blasting operations at all structures within 100 feet of a blast with a seismograph. The Contractor shall perform a series of test shots to ascertain the allowable load per delay. The Contractor shall adjust the maximum allowable particle velocity to site-specific requirements.
- D. The Contractor shall perform a pre/post construction survey of existing structures, utilities, bridges, and roadways on both sides of the water main alignment where any structures are within 100 feet of the water main centerline.
- D. The surveys shall be performed under the supervision of a Professional Engineer, registered in Massachusetts, and shall be documented with photographs.
- F. Blasting and explosion coverage shall be obtained if there is a need for blasting under this Contract, and no blasting shall be performed until such insurance has been secured. Insurance shall be in the following amounts:

One million dollars (\$1,000,000.00) for injuries, including accidental death, to any one person and subject to the same limit for each person, in an amount not less than two million dollars (\$2,000,000.00) on account of one accident; and an amount not less than one million dollars (\$1,000,000.00) for property damage on account of one accident, and two million dollars (\$2,000,000.00) on account of all accidents.

16.05 EXPLOSIVES

- A. The Contractor shall keep explosives on the site only in such quantity as may be needed for the work underway and only during such time as they are being used. He shall notify the Engineer, in advance, of his intention to store and use explosives. Explosives shall be stored in a secure manner and separate from all tools. Caps or detonators shall be safely stored at a point over 100 feet from the explosives. When the need for explosives has ended, all such materials remaining on the site shall be promptly removed from the premises.
- B. In addition to observing all municipal ordinances and State and Federal laws relating to the transportation, storage, handling and use of explosives, the Contractor shall conform to any further regulations which the Engineer may think necessary to this project, including those of property owners through whose properties the proposed facilities pass.

The licensed blaster shall at all times, have his license on the site and shall permit examination thereof by the Engineer or other officials having jurisdiction. Blasts shall be fired according to a schedule to be given to the Engineer.

- C. All operations involving explosives shall be conducted by experienced personnel and only with all possible care to avoid injury to persons and property. Blasting shall be done only with such quantities and strengths of explosives and in such manner as will break the rock approximately to the intended lines and grades and yet will leave the rock not to be excavated in an unshattered condition. Care shall be taken to avoid excessive cracking of the rock upon or against which any structure will be built, and to prevent injury to existing pipes or other structures and property above or below ground. Rock shall be well covered with rugs or mats, or both, where required. Sufficient warning shall be given to all persons in the vicinity of the work before a charge is exploded.
- D. All blasting shall be completed within a distance of 50 ft. before any portion of a masonry structure is placed or any pipe is laid.

16.06 BLASTING RECORDS

- A. The Contractor shall keep and submit daily to the Engineer an accurate record of each blast. The record shall show the general location of the blast, the depth and number of drill holes, the kind and quantity of explosive used, and other data required for a complete record.

16.07 EXCESS ROCK EXCAVATION

- A. If rock is excavated beyond the limits of payment indicated on the plans, and not specified or authorized in writing by the Engineer, the excess excavation, whether resulting from over breakage or other causes, shall be backfilled, by and at the expense of the Contractor, as specified below in this section.
- B. In pipe trenches, excess excavation below the elevation of the top of the bedding, cradle or envelope shall be filled with material of the same type, placed and compacted in the same manner, as specified for bedding, cradle, or envelope. Excess excavation, above said elevation shall be filled with suitable backfill material.
- C. In excavations for structures, excess excavation in rock beneath foundations shall be filled with concrete which shall possess strength of 4,000 psi, or 3,000 psi, at the option of the Engineer. Under any foundation which over excavation has occurred, the entire area under the foundation shall be either all concrete or all backfill, but not both. Other excess excavation shall be filled with suitable backfill material.

16.08 SHATTERED ROCK

- A. If the rock below normal depth is shattered due to drilling or blasting operations of the Contractor, and the Engineer considers such shattered rock to be unfit for foundations, the shattered rock shall be removed and the excavation shall be backfilled with concrete as required, except that in pipe trenches gravel fill may be used for backfill, if approved. All such removal and backfilling shall be done by and at the expense of the Contractor.

16.09 BACKFILLING ROCK EXCAVATIONS

- A. Where rock has been excavated and the excavation is to be backfilled, the backfilling above normal depth shall be done as specified under the related specifications. If material suitable for backfilling is not available in sufficient quantity from other excavation, The Contractor shall, at his own expense, furnish suitable material from outside sources.

SECTION 31.00.00

EARTHWORK

00.1	SCOPE OF WORK
00.2	RELATED WORK SPECIFIED ELSEWHERE
00.3	SITE INFORMATION
00.4	PROTECTION OF EXISTING CONDITIONS
00.5	DESCRIPTION
00.6	OPEN EXCAVATION
00.7	SEPARATION OF SURFACE MATERIALS
00.8	EXCAVATED MATERIAL
00.9	DRAINAGE
00.10	STRUCTURE EXCAVATION
00.11	SLABS ON GRADE
00.12	TRENCH EXCAVATION
00.13	TRENCH EXCAVATION IN FILL
00.14	TRENCH LIMITS
00.15	EARTH EXCAVATION BELOW NORMAL GRADE
00.16	EXCAVATION NEAR EXISTING STRUCTURES
00.17	RELOCATION AND REPLACEMENT OF EXISTING STRUCTURES
00.18	CARE AND RESTORATION OF PROPERTY
00.19	DUST CONTROL
00.20	BACKFILLING – GENERAL
00.21	BACKFILLING AROUND STRUCTURES
00.22	BACKFILLING IN OPEN TRENCH
00.23	MATERIAL FOR FILLING AND EMBANKMENTS
00.24	GRADING

00.1 SCOPE OF WORK

- A. The Contractor shall make all excavation of normal depth in earth for sites, structures, roads, and trenches in whatever substance encountered, and shall place and compact backfill to the dimensions and levels shown on the plans or as required by the Engineer. The Contractor shall provide all labor, material, equipment, supervision and incidentals to execute the work in strict accordance with these specifications and applicable drawings. Work under this section includes, but is not necessarily limited to, stripping and stockpiling of suitable topsoil, excavation of all materials encountered, trenching, sheeting, shoring, dewatering, blasting, maintenance of excavation, backfill, fill, providing borrow, compaction, and grading. Layout shall be done by the Contractor.
- B. The Contractor is advised that lines and grades, as shown on plans and profiles, are subject to change. Although it is the intention to adhere to that which is shown on the plans, the Engineer reserves the right to make changes in lines and grades of utilities and locations of manholes when such changes may be necessary or advantageous.
- C. The Contractor's particular attention is directed to the related sections of the specifications. Specific information is provided for stockpiling material on-site or off-site and disposal of unsuitable material. Special requirements applicable to excavation to remove soft material, site preparation settlement, and timing of construction are identified.
- D. In open trenching on State, County, or local highways and railroad properties, the Contractor shall be governed by the conditions, restrictions and regulations made by the appropriate body. All such regulations shall be in addition to those set forth in these specifications.

- E. Any excavation, dewatering, sheeting, and bracing shall be carried out in such a manner as to eliminate any possibility of undermining or disturbing the foundations of any existing structures or any work previously completed under this Contract, or as specified herein.
 - F. The Contractor shall fill or backfill all excavations as indicated on the Contract Drawings and as specified herein, but is advised that some of the excavated material may not be suitable as backfill material.
- 00.2 RELATED WORK SPECIFIED ELSEWHERE
- A. SECTION 31.23.23 - FILL AND BACKFILL MATERIALS
 - B. SECTION 31.01.00 - COMPACTION CONTROL AND TESTING
- 00.3 SITE INFORMATION
- A. Existing grades and other site information shown on the applicable Contract Drawings are approximate and have been compiled by field surveys. The Owner does not guarantee that grades shown will not vary from the actual site conditions. The Contractor must make his own field investigations to determine all conditions affecting the work to be done and materials needed and make his bid in sole reliance thereon.
- 00.4 PROTECTION OF EXISTING CONDITIONS
- A. General: Extreme care shall be exercised to avoid existing trees, shrubs, facilities, utilities, fences, and private property that are to remain and all necessary precautions taken to prelude damage to these items. Any damage to these items as a result of work performed by the Contractor shall be repaired by the Contractor at his own expense.
 - B. Utility agencies shall be contacted and advised of proposed work prior to the start of actual excavation. The Contractor shall obtain information from the proper sources and authorities concerning locations of all utilities within the scope of this work, in order that there will be no damage done to such utilities.
 - C. If and when encountered, utilities shall be supported and protected, and the Engineer shall be notified. Entrance, opportunity, and ample time shall be allowed for such measures as may be required for the continuance of utility services. Utilities to be abandoned within excavation areas shall be removed, plugged, or capped by the Contractor as directed by the Engineer. Permanent existing utilities near the excavation and/or construction work shall be properly protected during construction work, and any damage to such permanent utilities shall be repaired by the Contractor without expense to the Owner or Engineer.
 - D. All utility services shall be supported by suitable means so that the services shall not fail when tamping and settling occurs. No separate item is provided for service supports and the Contractor must cover supports in the unit prices bid for the roadway construction.
 - E. The Contractor shall not be compensated for any additional work involved whenever a utility or underground structure is so encountered within the work limits.
 - F. The Contractor shall not be compensated for any additional work involved if the utilities or underground structures cross the trench line transversely above or below the proposed work.

- G. Rules and regulations governing the respective utilities shall be observed. Active utilities shall be adequately protected from damage, and shall not be removed or relocated except as indicated or directed.
- H. All existing pipes, poles, wires, fences, curbing, and other structures which, in the opinion of the Engineer, must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from injury by the Contractor, and in case of injury, the Contractor shall notify the appropriate party so that proper steps may be taken to repair any and all damage done. The Contractor shall at his own expense replace, repair, or restore the affected facilities to their original condition or shall reimburse the owner of said facilities for such expenses as the owner may accrue. When the owners do not wish to make the repairs themselves, all damage shall be repaired by the Contractor, or, if not promptly done by him, the Engineer may have the repairs made at the expense of the Contractor.
- I. Survey markers: Any existing property boundary markers, City bounds, control points, and datum elevations markers or bench marks to be removed and replaced as shown on the Contract Drawings or directed by the Engineer shall be removed and replaced by the Contractor with all expenses for such replacement paid for by the Contractor.
- J. The Contractor shall provide and maintain barricades, signs, lights, etc., required for the protection of personnel, materials and property. Barricades, etc., shall conform with all codes and regulations, and shall be lighted at night with lanterns, and reflectorized paint as directed or required for safety, and shall be removed upon completion of the Contract.

00.5 DESCRIPTION

- A. The Contractor shall make excavations in such manner and to such width as will give suitable room for building the structures or for constructing the roadways but complying with the limits shown on the Contract Drawings. The Contractor shall furnish and place all sheeting, bracing, and supports; shall do all pumping and draining and any other work necessary for dewatering and shall render the bottom of the excavation firm and dry and in all respects acceptable.
- B. In no case, except as provided for in Part 3.10 titled "Trench Limits", shall the earth be plowed, scraped, or dug by machinery so near to the finished grade as to result in disturbance of material below said grade. The last of the material to be excavated shall be removed with pick and shovel just before placing pipe, masonry, or other structures.
- C. All excavations shall be braced with steel sheeting or steel excavation boxes as specified in the related specifications or as shown on the Contract Drawings.

00.6 OPEN EXCAVATION

- A. All excavation, except as otherwise specified or permitted, shall be open cut. The length of trench open at any one time will be controlled by the Engineer. The Contractor shall not have more than three hundred (300) feet of trench open at any one time during daylight hours.

00.7 SEPARATION OF SURFACE MATERIALS

- A. From areas within which excavations are to be made, loam, topsoil, sand, and gravel shall be carefully removed and separately stored to be used again as directed; or, if the

Contractor prefers not to separate materials, he shall furnish as directed and without additional compensation, clean backfill and loam and topsoil at least equal in quantity and quality to that excavated.

- B. When excavations are to be made in paved surfaces, the Contractor shall machine cut the pavement along the proposed trench lines, with either a pneumatic hammer or mechanical saw in such a manner that the edges of the remaining pavement follow clean, trim, straight lines. If pavement is removed, it shall not be mixed with other excavated material, but shall be disposed of away from the site before the remainder of the excavation is made.

00.8 EXCAVATED MATERIAL

- A. Excavated material shall be so placed as not to interfere with travel on the streets and driveways by the occupants of adjoining property, cause undesirable settlement, or obstruct free access to hydrants and gate valves. Access for emergency vehicles shall be maintained at all times. Excavated material shall not be deposited on private property until written consent of owner or owners thereof has been filed with Engineer. Onsite excavated material stockpiles shall be stored as directed by the Engineer. However, if it is impractical or unsafe to stack suitable, excavated, backfill material adjacent to the work, the material shall be hauled and stored at a location provided by the Contractor at no additional expense to the Owner. Excavated material shall not be deposited in brooks or streams. Excavation shall include the removal of unearthed wooden structures.
- B. It is expressly understood that no excavated materials shall be removed from the site of work or disposed of by the Contractor except as directed or approved by the Engineer. All material designated by the Engineer to be removed from the site shall be immediately removed and legally disposed of according to Federal, State and Local codes and regulations. The Contractor will be required to clean any roads and streets of material that is spilled from his operation of hauling and disposing of unsuitable excavated material.
- C. Suitable excavated material may be used for fill or backfill on other parts of the work.
- D. Upon completion of the backfilling, the streets or property shall be cleaned, surplus material removed, and the surfaces restored to the condition in which they were before construction. All materials left over in public highways shall become the property of the Contractor. If the Contractor fails to promptly remove such surplus material, the Engineer may have the work done and charge the cost thereof as money paid to the Contractor.
- E. Material excavated from private property shall belong to the property owner or his representative, and shall be disposed of by the Contractor, as required by said property owner or representative, but the longest haul requested by the Owner shall in no case exceed 5 miles. If the Contractor fails to promptly remove such surplus material, the Engineer may have the same done and charge the cost thereof as money paid to the Contractor.

00.9 DRAINAGE

- A. At all times during construction, the Contractor shall provide, place and maintain ample means and devices with which to intercept and/or remove promptly, and dispose properly all water entering trenches and other excavation, or the water may flow along or across the site of work; and keep said excavations dry until the structures, pipes, and appurtenances to be built have been completed to such extent that they will not be damaged. At this time the Contractor shall remove such temporary means and devices.

- B. Every precaution necessary to obtain water-tight construction of all joints in pipe, manholes, wyes, and drop connections must be taken.
- C. All ground water which may be found in trenches or excavations and any water which get may into them from any cause whatsoever shall be removed.
- D. All water pumped or drained from the work shall be disposed of in a suitable manner, satisfactory to the Engineer, without undue interference with other work or damage to pavements, other surfaces, or property.

00.10 STRUCTURE EXCAVATION

- A. The Contractor shall excavate to the elevations shown on the plans, or as directed by the Engineer. If the Contractor excavates below the elevations specified, he shall bring the excavation back to the proper elevation by backfilling with screened gravel (Type 6 material) and tamping in 6" layers to provide a compact base. The backfill material must be approved by the Engineer before being placed. If the Engineer directs any changes in elevation or dimension of the structure excavations from that shown on the plans, the Contractor shall be paid for work performed under the appropriate bid item. Any increase in cost resulting from backfilling, or increasing the size of the excavation or foundations because of overexcavation in depth, shall be borne by the Contractor. Cut slopes shall have a maximum slope of 2:1 if not braced. When excavation has reached specified dimensions, the Engineer shall be notified and he will determine if conditions are satisfactorily met before work is allowed to continue.

00.11 SLABS ON GRADE

- A. Where slabs on undisturbed earth occur, all loams, organic or other undesirable materials shall be removed as required by the Engineer, and the area grubbed to a depth of at least six (6) inches below the finished subgrade elevation or as indicated on the Contract Drawings. Where slabs on fill occur, the fill will also be compacted in accordance with the related section of the specifications.

00.12 TRENCH EXCAVATION

- A. Excavation shall not commence in any section until the pavement covering the proposed excavation has been properly cut.
- B. In general, trenches shall be excavated to such depth as will permit pipe to be laid at elevations, slopes or depths of cover as indicated on the Contract Drawings. Deeper trenches shall be provided where necessary on account of the conformation of the ground and to permit the alignment of the pipe without undue deflection of joints.
- C. Trenches shall be excavated by hand or machinery to the width and depth indicated on the Contract Drawings and specified herein under Paragraph 3.10 "Trench Limits". All loose material shall be removed from the bottom of the trench so that the bottom of the trench will be in an undisturbed condition, and so as to provide a proper foundation for pipe bedding material.
- D. Particular care shall be taken that no stone 6 inches or larger in any diameter protrudes more than 3 inches from the bottom or side of the trench. Suitable bell holes shall be made in the trench at joints as required.

- E. At completion of a workday, all excavations shall be covered by backfilling to existing grade or plating to entirely cover the opening or completely enclosing with a 6 foot high temporary chain link fence.
- F. In earth excavation in sections where bedding is excluded, the bottom of the trench shall be shaped so as to conform to the outside of the pipe, particular care being taken to recess the bottom of the trench in such a manner as to relieve the bell of all load.

00.13 TRENCH EXCAVATION IN FILL

- A. If pipe is to be laid in embankments or other recently filled material which are more than 1 foot below the invert of the pipe, the fill material shall be placed and properly compacted to final grade or to a height of at least 3 feet above the top elevation of the pipe, whichever is the lesser, before laying pipe. Particular care shall be taken to ensure maximum consolidation of material under the pipe. The pipe trench shall then be excavated as though in undisturbed material.

00.14 TRENCH LIMITS

- A. The limits of normal trench excavation shall be as shown on the Contract Drawings or specified herein. Trenches shall be excavated to the required depths, adding, however, to such depths the thickness of the pipe and, where applicable, the thickness of the bedding. The width of the trench at the bottom shall always be wide enough to make the joints properly. When, in the opinion of the Engineer, it is necessary to lay a concrete foundation, the excavation shall be made as shown on the details or as ordered by the Engineer.
- B. Where the bottom of the trench, by mistake of the Contractor, has been taken out to a greater depth than above specified, it shall be refilled to the proper grade, using screened gravel material by the Contractor who shall receive no additional compensation whatever therefore. Refilling with earth to bring the bottom of the trench to the proper grade will not be permitted.
- C. The Contractor shall at all times exercise care not to excavate outside the trench limiting lines as shown on the Contract Drawings unless otherwise authorized by the Engineer.
- D. Bedding for pipe will be as detailed on the Contract Drawing and as specified in the related section of the specifications.

00.15 EARTH EXCAVATION BELOW NORMAL GRADE

- A. If in the opinion of the Engineer, the material at or below the depth to which excavation for structures and pipes would normally be carried is unsuitable for foundation, it shall be removed to such widths and depths as directed and replaced with suitable material. Such work shall be paid for under appropriate items.
 - 1. Roadway over-excavations shall be backfilled with compacted Type 3 material.
 - 2. Trench over-excavation shall be minimum of 3 feet or as directed by the Engineer and shall be lined with a geotextile fabric.

00.16 EXCAVATION NEAR EXISTING STRUCTURES

- A. Attention is directed to the fact that there are pipes, drains, and other utilities in certain locations. Some of these have been indicated on the Contract Drawings, and an attempt

has been made to show all of the lines and services, but the completeness of accuracy of the information given is not guaranteed.

- B. All pipes and other utility conduits, shall be located on the ground with pipe finding equipment well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground. All such location work shall be provided by the Contractor in cooperation with the appropriate utility to the satisfaction of the Engineer at no extra cost.
- C. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools, as directed. Such manual excavation when incidental to normal excavation shall be done to the satisfaction of the Engineer at no extra cost.

00.17 RELOCATION AND REPLACEMENT OF EXISTING STRUCTURES

- A. Whenever the Contractor encounters certain existing structures as described below and is so ordered in writing, he shall do the whole or such portions of the work as he may be directed, to change the location or, remove and later restore, or replace such structures, or to assist the Owner thereof in so doing. For all such work, the Contractor shall be paid under such items of work as may be applicable, otherwise as Extra Work.
- B. In removing existing pipes or other structures, the Contractor shall use care to avoid damage to material, and the Engineer shall include for payment only those new materials which, in his judgment are necessary to replace those unavoidably damaged.
- C. The structures to which the provisions of the preceding two paragraphs shall apply include pipes, wires, and other structures which (a) are not indicated on the Contract Drawings or otherwise provided for, (b) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (c) in the opinion of the Engineer will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.
- D. When fences interfere with the Contractor's operations, he shall remove and (unless otherwise specified) later restore them to at least as good condition as that in which they were found immediately before the work was begun. The restoration of fences shall be done as promptly as possible and not left until the end of the construction period.

00.18 CARE AND RESTORATION OF PROPERTY

- A. Excavation machinery and cranes shall be of suitable type and be operated with care to prevent damage to trees not to be cut and overhanging branches and limbs.
- B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. In case of cutting or unavoidable damage to branches, limbs, and trunks of trees, the cut or damaged portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.
- C. Cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations shall be protected by suitable means or shall be dug up and temporarily replanted and maintained. After the construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is reestablished. If cultivated hedges, shrubs, and plants are injured so such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to the kind and quality existing at the start of the work.

- D. On paved surfaces, the Contractor shall not use or operate tractors, bulldozers, or other power operated equipment, with treads or wheels of which are so shaped to cut or otherwise damage such surfaces. All surfaces which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operation. Suitable materials and methods shall be used for such restoration.
- E. The restoration of existing property or structures shall be done as promptly as practicable and shall not be left until the end of the construction period.

00.19 DUST CONTROL

- A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities so as to minimize the creation of dust. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish the material, load, deliver, and spread it as directed.

00.20 BACKFILLING - GENERAL

- A. In general, and unless other material is indicated on the Contract Drawings or specified elsewhere, material used for backfilling trenches and excavations around structures shall be suitable material which was removed in the course of construction excavation. Backfilling shall not commence until the Engineer gives permission. Where the trench is in an area to be paved, or in an unpaved vehicular or pedestrian traveled way, or the shoulder of a paved roadway, a suitable pavement base shall be provided to a depth of at least that required in the related sections of the specifications. 12" layer of crushed stone is to be installed under slab on grade
- B. Suitable backfill material shall be free from cinders, ashes, refuse, boulders, rocks, or stones greater than 6 inches in any dimension, unsuitable organic material, or other material which, in the opinion of the Engineer, is unsuitable.
- C. Frozen material shall not be placed in the backfill, nor shall backfill be placed upon frozen material. Previously frozen material shall be removed, or shall be otherwise treated as required, before new backfill is placed.

00.21 BACKFILLING AROUND STRUCTURES

- A. The Contractor shall not deposit backfill against structures until the structure has obtained sufficient strength to withstand the earth pressure placed upon it and in no case less than seven days, nor before carrying out and satisfactorily completing the tests specified in the related sections of the specifications. Compaction of backfill against concrete structures shall not be carried out by motorized equipment closer to the structure than the depth of the structure below grade. Such backfilling shall be carried up evenly on all walls of a structure simultaneously with maximum allowable variation of 2 feet in elevation at any point. Unequal soil pressures shall be avoided by depositing the material evenly around the structure.
- B. In addition, where pipe is connected to the structure, the backfilling procedure shall be carried out as specified in "Backfilling in Open Trench".
- C. Measurement of fill material under this work will not include any filling made beyond a vertical plan of one foot outside the footings except as directed.
- D. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of the day's operations. Prior to terminating work for the day, the final layer of compacted fill

shall be rolled or graded to eliminate ridges of soil left by compaction equipment. No fill shall be placed and compacted on snow, ice, or soil that was permitted to freeze prior to compaction.

00.22 BACKFILLING IN OPEN TRENCH

- A. As soon as practical after pipe has been laid in accordance with the appropriate sections and the pipe joints have been properly made, the backfilling shall begin, and shall continue without delay. However, the trench shall be kept open long enough for the Engineer to locate existing utilities uncovered during excavation and to inspect pipe or structure conditions.
- B. If a screened gravel or concrete envelope is not used, the selected material shall be (see Contract Drawings for additional or superseding information) free from large lumps and stones having any dimension greater than 2 inches, and shall be placed simultaneously on both sides of the pipe, so that there will be no tendency to displace the pipe alignment. In placing the material, care shall be taken that stones do not strike the pipe and geotextile fabric shall be installed to the limits shown on the Contract Drawings at the locations specified on the drawings or as directed by the Engineer.
- C. A sand blanket (Type 2 material) shall be placed at the sides of the pipe up to the top of the pipe and shall be hand-placed and thoroughly compacted using approved hand-operated tampers. Backfilling shall be carried up evenly on both sides of the pipe.
- D. Type 2 material shall be extended up to a level of 1 foot above the top of the pipe shall be placed in 6 inch layers, leveled along the length and width of the trench and thoroughly compacted with approved tampers.
- E. The sand blanket (Type 2 material) may be omitted for cast iron, ductile iron and reinforced concrete pipe provided, however, that no stone large than 2 inches is in contact with the pipe.
- F. The backfill in the remainder of the excavation above the top of the screened gravel or concrete envelope, if used, shall be Type 1, backfilled in approximately 12 inch layers and promptly compacted by mechanical tamping. Material used for backfilling to a point two feet over the pipe shall contain no stones larger than three inches in greatest dimension. Backfilling or tamping with trenching machines is prohibited.
- G. Care shall be taken in the use of mechanical or other tampers not to injure or move the pipe or cause the pipe to be supported unevenly.
- H. Large masses of backfilling material shall not be dropped into the trench in such a manner, in the opinion of the Engineer, as to endanger the pipe.
- I. All backfilled trenches shall be thoroughly surface tamped with a tamping machine approved by the Engineer.
- J. Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material.
- K. No compacting shall be done when the material is too wet to be compacted properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as may be necessary to obtain proper compacting.

00.23 MATERIAL FOR FILLING AND EMBANKMENTS

- A. Approved selected materials available from the excavations and not required for backfill around pipes or under structures may be used for site preparation except as otherwise specified. Material needed in addition to that available from construction operations shall be obtained from approved Type 1, 2, 3, or 4 sources.
- B. All material, whether from the excavations or offsite, shall be such nature that after it has been placed and properly compacted in 12 inch layers, it will make a dense, stable fill. It shall not contain vegetation, roots, stones over 6 inches in diameter, or porous material.

00.24 GRADING

- A. Grading, in preparation for placing of paved walks and drives and appurtenances, shall be preformed at all places to the lines, grades, and elevations as directed by the Engineer. All unsuitable material encountered, of whatever nature, shall be removed and disposed of as directed. During the process of grading, the subgrade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or conditions or the work.
- B. The right is reserved to make minor adjustments or revisions in lines or grades if found necessary as the work progresses or in order to obtain satisfactory construction.
- C. All slopes cut during construction shall be uniformly redressed to the slope, cross-section and alignment existing prior to construction as indicated on the Contract Drawings or as directed by the Engineer.

END OF SECTION 31.00.00

SECTION 31.01.00 COMPACTION CONTROL AND TESTING

01.1	SCOPE OF WORK
01.2	RELATED WORK SPECIFIED ELSEWHERE
01.3	SUBMITTALS
01.4	TEST METHODS
01.5	COMPACTION EQUIPMENT
01.6	COMPACTION REQUIREMENTS
01.7	APPROVAL OF FILL OR BACKFILL MATERIAL
01.8	FREQUENCY OF COMPACTION TESTING
01.9	FAILED TESTS

01.1 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials and equipment necessary to place and compact fill or backfill. The Contractor shall furnish all equipment necessary to collect soil samples.
- B. Actual testing of soil samples with the exception of in situ-density determinations shall be done by an independent testing laboratory approved by the Owner. In situ-density determinations shall be made by the Engineer or his representative. Copies of test results shall be furnished by the test laboratory directly to the Engineer.

01.2 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 31.00.00 - EARTHWORK
- B. SECTION 31.23.23 - FILL AND BACKFILL MATERIALS

01.3 SUBMITTALS

- A. Prior to commencement of filling and backfilling operation, the Contractor shall submit for approval a detailed list six (6) copies unless otherwise specified) of the types of compacting equipment to be utilized in the work, and the number of each.

01.4 TEST METHODS

- A. Contractor shall provide heavy duty sample bags for fill or backfill material to be tested. Soils shall be classified as in the in the related sections of the Specifications which include AASHTO specifications M145 Recommended Practice for Classification of Soils as Soil-Aggregate Mixtures for Highway Construction Purposes.
- B. Soil samples shall be prepared for testing according to ASTM D42 Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
- C. Gradation testing shall be done according to ASTM D2216 Particle Size Analysis of Soils and ASTM D1140 test for Amount of Materials in Soils Finer than the No. 200 sieve.
- D. Moisture content of soil shall be determined by ASTM D2216 Laboratory Determination of Moisture Content of Soil.
- E. Liquid Limits and Plasticity Index shall be determined ASTM D423 Liquid Limit of Soils and ASTM D424 by Plastic Limit and Plasticity Index of Soils.

- F. Maximum dry density for each type of fill shall be determined by ASTM D1557 Method D Moisture - Density Relations of Soils using 10-lb. Hammer and 18-in. Drop.
- G. In-place field unit weight shall be determined by ASTM D- 1556 Density of Soil in Place by the Sand-Cone Method.
- H. Maximum dry density may, at the discretion of the Engineer, be determined in accordance with ASTM D-2049 test for Relative Density of Cohesionless Soils.

01.5 COMPACTION EQUIPMENT

- A. No backfilling shall be done until the compacting equipment list has been submitted and approved as conforming to the Contract requirements. Sufficient compacting equipment shall be available at all times, thereafter while backfilling is being conducted.
- B. Each layer of fill shall be inspected prior to compaction. All visible roots, vegetation, or debris shall be removed. Stones larger than 6 inches in diameter shall be removed. The water content of each layer shall be determined to be suitable for compaction or shall be brought to a suitable condition. Material incorporated in the fill which is not in satisfactory condition shall be subject to rejection and removal at the Contractor's expense. Placement of fill on frozen ground or placement of fill material which is frozen will not be permitted.
- C. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or too great an application of water, to compact it properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions shall be taken as may be necessary to obtain proper compaction.
- D. Filling shall begin in the lowest section of the area. Fill shall be spread in layers as specified. The surface of each layer shall be approximately horizontal but will be provide with sufficient longitudinal and transverse slope to provide for runoff of surface water from every point. Filling shall be conducted so that no obstruction to drainage from other sections of the fill area is created at any time. Sumps, if any, shall be continuously maintained in effective operating condition.
- E. Each layer of material shall be compacted by the use of only approved rollers or other approved means so as to secure a dense, stable, and thoroughly compacted mass. At such points as cannot be reached by mobile mechanical equipment, or where such equipment is not permitted, the materials shall be thoroughly compacted by the use of suitable power-driven tampers.
- F. The compaction equipment shall be operated so as to make a minimum of three passes over each section of each layer of fill. Each successive pass shall overlap the adjacent pass by not less than 10%. Additional passes shall be made to obtain the required compaction, if necessary.
- G. Compaction by water-jetting will be allowed only if the Engineer deems the conditions suitable for this method. Wherever the material contains excessive amounts of clay or loam to prevent satisfactory drying, water-jetting shall not be used.
- H. If the material is allowed to be compacted by water-jetting, it shall be placed in uniform layers not exceeding 4 ft. deep. Each layer shall be thoroughly saturated throughout its full depth and at frequent intervals until all slumping ceases. For water-jetting, the Contractor shall provide one or more jet pipes, each of sufficient length to reach the

specified depth and not less than 1-¼ in. in diameter. The jet pipe shall be equipped with a quick-acting valve and sufficient fire hose to connect to a hydrant or pump having adequate pressure and capacity. A hydrant shall be utilized only upon approval of the local Water and/or Fire Departments.

01.6 COMPACTION REQUIREMENTS

- A. Pipe Bedding: Bedding shall be Type 6 fill placed uniformly in 6 inch layers and compacted unless otherwise specified. Compaction shall be accomplished by 20 lb. hand tampers.
- B. Pipe Sand Blanket: Material shall be Type 2 fill placed uniformly in 6 inch layers and compacted to 90% of maximum dry density of the sand. Compaction shall be accomplished by 20 lb. hand tampers.
- C. Trench Cover: Material shall be Type 1, 2, 3 or 4 fill placed uniformly in 12 inch layers and compacted to 95% of maximum dry density for the type of material used. Compaction shall be accomplished by mechanical tampers. Compaction by water-jetting shall be in accordance with the related sections of the specifications.
- D. Catch Basin and Manhole Base Bedding: Material shall be Type 6 fill placed uniformly in 6 inch layers and compacted. Compaction shall be accomplished by 20 lb. hand tampers or pneumatic tampers.
- E. Structural Fill (foundation sub-grade, foundation underdrainage, pavement sub-grade, pavement sub-base): Material for foundation sub-grade or pavement sub-grade shall be Type 3 fill. Structural fills shall be placed in 6 inch layers compacted to 95% maximum dry density for a given type of material. Compaction shall be by mechanical power driven vibratory compactors. Pavement sub-grade in cut areas shall be rolled and compacted to 95% density of the in situ material.
- F. Fill around structures shall be Type 1, 2, 3, or 4 material placed in 6 inch layers and compacted to 95% maximum dry density. Compaction shall be accomplished by mechanical power driven vibratory compactors. Compaction of backfill against concrete structures shall not be carried out by motorized equipment closer to the structure than the depth of the structure below grade.
- G. Non Structural Fill (Landscaping and other uses as designated by the Engineer): Material shall be Type 1, 2, 3 or 4 placed in 12" layers and compacted to 45% maximum dry density for the given type of material used. Compaction shall be accomplished by mechanical power-driven vibratory compactors.

01.7 APPROVAL OF FILL OR BACKFILL MATERIAL

- A. Before placing or compacting any on-site or borrow material, the Contractor shall submit a sample of the material for testing. No on-site material shall be placed until approved by the Engineer.
- B. The Engineer may at any time require additional laboratory testing should he observe any changes in gradation of the material being placed. No additional fill shall be placed or compacted until the material has been approved. If the material does not meet the required gradation and Otterburg limits for a given type of fill, the Contractor shall remove it as his expense. The Contractor may use the material for other types of fill providing it meets the required gradation and properties of that type.

01.8 FREQUENCY OF COMPACTION TESTING

- A. The Engineer may perform tests of the degree of compaction obtained, in any area he may select. Payment for performing tests will be made by the Owner. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted material including re-testing, shall be borne by the Contractor. If improper compaction methods are used, the Owner shall have the right to discontinue payments from the Contractor for said payment item until the situation is corrected.

01.9 FAILED TESTS

- A. If the percentage compaction at any point is found to be unacceptable, additional compaction with or without modification of the field moisture content as directed by the Engineer, shall be performed and a second moisture-density determination made. This procedure shall be repeated until satisfactory compaction is obtained. If after five (5) tests any fill or backfill material cannot be compacted to the required density it shall be removed and disposed of at the Contractor's expense.

END OF SECTION 31.01.00

SECTION 31.11.00 CLEARING AND GRUBBING

11.1	SCOPE OF WORK
11.2	RELATED WORK SPECIFIED ELSEWHERE
11.3	CLEARING
11.4	GRUBBING
11.5	DISPOSAL

11.1 SCOPE OF WORK

- A. The provisions of this section apply to undeveloped or cross-country building site areas as designated by the Engineer. It is the intent of the Contract Documents that damage and/or alteration of existing terrain be minimized and confined to a limited area.
- B. The Contractor shall clear and grub a permanent right-of-way as shown on the plans, unless otherwise directed by the Engineer. The Contractor shall also clear and grub a temporary right-of-way such that the limits of the temporary right-of-way as defined on the plans are not exceeded. The Contractor shall obtain the written consent of the property owner prior to cutting any trees within the temporary right-of-way. Trees approved for cutting shall be marked by a 2 inch wide paint ring.
- C. The Contractor shall not cut or injure any existing trees or other vegetation outside the limits of the areas of work, as indicated on the Contract Drawings, without written approval from the Engineer. Trees or group of trees to be left in place, inside the work limits, shall be protected from damage by barriers or other suitable means to be approved by the Engineer.
- D. The respective owners of the land over which any easement passes shall have the right to cut and remove logs and other wood of value in advance of the Contractor's operations. The Contractor will cut all logs in approximately 6 foot lengths and stack the logs neatly at the edge of the right-of-way for the respective property owner's use.

11.2 RELATED SPECIFIED ELSEWHERE

- A. SECTION 31.00.00 - EARTHWORK

11.3 CLEARING

- A. With the exception of those trees and other vegetation which the Engineer denotes for preservation by the Contractor, the Contractor shall cut or remove all trees, saplings, brush, and other vegetative matter such as snags, leaves, saw dust, bark, etc., and refuse. The ground shall be cleared to the width of the permanent easement unless otherwise directed by the Engineer.
- B. Trees or group of trees designated to be left standing shall be trimmed of all dead branches 1 ½ inches in diameter or more. The trees shall be trimmed of live branches to height specified by the Engineer. All limbs which are to be trimmed must be neatly cut as close as possible to the tree trunk or a major branch; and all cuts more than one inch in diameter shall be painted by an approved tree wound paint.
- C. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operation, trees, stumps, and stubs to be cleared

shall be cut as close to the ground surface as practicable, with no more than 6 inches remaining above the ground surface in the case of small trees, and 12 inches in the case of large trees.

11.4 GRUBBING

- A. In areas to be grubbed, the Contractor shall remove completely all stumps, remove to a depth of 18 inches all roots larger than 3 inches in diameter, and remove to a depth of 6 inches all roots larger than ½ inch in diameter. Such depths shall be measured from the existing ground surface or the proposed finished grade, whichever is the lower. Depressions resulting from grubbing shall be filled in with approved material and compacted to the height of the adjacent surface.

11.5 DISPOSAL

- A. All material collected in the course of the clearing and grubbing, and not to remain shall become the property of the Contractor and shall be disposed of in a manner satisfactory to the Engineer. Disposal of the materials in the clearing and grubbing operations and shall not be left until the final cleanup period.
- B. Burning shall not be allowed without a permit from the Fire Department and the approval of the Engineer. The Contractor will be responsible for compliance with all Federal, State and Local Laws regarding such burning. The site of the fire shall be picked out in advance by the Engineer. Burning shall be carried out in such a manner as to avoid all hazards which might cause damage to existing structures, construction in progress, trees, vegetation or other property not designed to be disposed of. All disposal by burning shall be under constant attention by the Contractor until the fire has burned out or has been properly extinguished.
- C. Prior to depositing surplus material at any offsite location, the Contractor shall obtain a written agreement between himself and the owner of the property. The agreement shall state that the owner of the property gives permission for the Contractor to enter and deposit the material at no expense to the project Owner or the Engineer. A copy of the agreement shall be furnished to the Engineer.
- D. Because of the disease-carrying characteristics of elm trees, the Contractor shall take special care to completely dispose of all elm trees or the limbs of elm trees removed, by burying under 12 inches of soil in approved areas. Where it is evident that removed timber carries Dutch Elm disease, then the timber shall be disposed of in accordance with applicable laws.

END OF SECTION 31.11.00

SECTION 31.23.23

FILL AND BACKFILL MATERIALS

23.1	SCOPE OF WORK
23.2	APPROVAL OF MATERIALS
23.3	RELATED WORK SPECIFIED ELSEWHERE
23.4	TYPE 1 - COMMON BORROW
23.5	TYPE 2 - SAND BORROW
23.6	TYPE 3 - SAND AND GRAVEL
23.7	TYPE 4 - COARSE GRAVEL
23.8	TYPE 5 - LOAM BORROW AND TOPSOIL
23.9	TYPE 6 - SCREENED GRAVEL MATERIALS
23.10	TYPE 7 - CRUSHED STONE
23.11	PLACING AND COMPACTING

23.1 SCOPE OF WORK

- A. The Contractor shall furnish all labor, equipment, fill and backfill material and incidentals for site preparation and to meet finished contours as shown on the Contract Drawing. The use of the fill and backfill material is specified elsewhere. The Engineer may order the use of granular fill materials for purposes other than those specified in other sections, if in his opinion such use is advisable.

23.2 APPROVAL OF MATERIALS

- A. The Contractor shall furnish the Engineer with representative samples and a gradation analysis of each type of soil. If the source of materials changes significantly or a different source is used, re-submittals and re-approvals must be made.

23.3 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 31.00.00 - EARTHWORK
C. SECTION 31.23.24 - COMPACTION CONTROL AND TESTING

23.4 TYPE 1 - COMMON BORROW

- A. Common Borrow shall be a granular material obtained from approved on-site or off-site natural deposits and unprocessed except for the removal of unacceptable material and stones larger than six (6) inches. It shall not contain vegetation or roots. It shall be free from loam, clay, fine wood, trash, and other objectionable materials or harmful substances.
- B. Common Borrow shall consist of a material satisfactory to the Engineer and not specified as gravel borrow, sand borrow, special borrow material or another particular kind of borrow. This material shall have the physical characteristics of soils designated as group A-1, A-2 - 4 or A-3, under AASHTO-M145. It shall have properties such that it may be readily spread and compacted for the formation of embankments.

23.5 TYPE 2 - SAND BORROW

- A. Sand Borrow shall consist of clean, inert, hard, durable grains of quartz or other hard durable rock. It shall be free from clay, loam, vegetable or other objectionable matter.
- B. Material for pipe cover, landscaping, or other uses as determined by the Engineer, shall be well graded as follows or as indicated on the Contract Drawings. The allowable amount of material passing a No. 200 sieve as determined by AASHTO-T11 shall

not exceed 10 percent by weight.

<u>Sieve Size</u>	<u>Percent by Weight Passing Through</u>
3/8 inch	85 - 100
#16	50 - 85
#200	0 - 10

23.6 TYPE 3 - SAND AND GRAVEL

- A. The sand and gravel material for foundation sub-grades or structural fills shall meet AASTHO-M145, for A-1-a, A-1-b, or A-3 soils. The mixture shall consist of clean hard durable particles or fragments. It shall be free from loam, organic or other objectionable matter.
- B. Subgroup A-1-a includes those materials consisting predominantly of stone fragments or gravel, either with or without a well-graded binder of fine material and with 50% maximum passing the No. 10 sieve, 30% maximum passing the No. 40 sieve and 15% maximum passing the No. 200 sieve. The fraction passing the No. 40 shall have a maximum plasticity index of 6.
- C. Subgroup A-1-b includes those materials consisting predominantly of course sand either with or without well-graded soil binder and with 50% maximum passing the No. 40 sieve and 25% maximum passing the No. 200 sieve. The fraction passing the No. 40 shall have a maximum plasticity of 6.
- D. Group A-3 material shall be fine beach sand without silty or clay fines or with a very small amount of non-plastic silt. The group includes also stream deposited mixtures of poorly-graded fine sand and limited amounts of coarse sand and gravel; 51% minimum shall pass the No. 40 sieve, and 10% maximum shall pass the No. 200 sieve.

23.7 TYPE 4 - COARSE GRAVEL

- A. The material shall consist of clean hard, inert, durable particles or fragments. It shall be free from clay, loam, vegetable or other objectionable matter. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used.
- B. Material for foundation under drainage, pavement subbase, or other uses as determined by the Engineer shall be well graded as follows:

<u>SIEVE SIZE</u>	<u>PERCENTAGE BY WEIGHT PASSING</u>
3 inch	100
1 1/2 inch	70- 100
3/4 inch	50- 85
#4	30- 60
#200	0-12 (based on fraction passing No. 4)

- C. The processed material shall be stockpiled in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

23.8 TYPE 5 - LOAM BORROW AND TOPSOIL

- A. Material shall conform to related sections of the specifications.

23.9 TYPE 6 - SCREENED GRAVEL MATERIALS

- A. The gravel shall generally conform to ASTM-C33 and shall consist of clean, hard, inert, durable particles or fragments. It shall be free from clay, loam, organic or other objectionable matter. Crushed rock of suitable size and grading may be used instead of screened gravel. The specifications which follow shall apply to whichever material is used.
- B. Material for trench stone fill shall consist of sound angular stones; 50 to 70 percent of which shall weigh at least 500 pounds and the remainder shall weigh not less than 50 pounds each.
- C. Material for trench bedding shall be well graded from ¾ inch to 2 inch.
- D. Material for stabilizing trench base shall be well graded from ½ inch to 1 ½ inch.
- E. Material for pipe bedding, landscaping, or other uses as determined by the Engineer, shall be well graded as follows:

<u>SIEVE SIZE</u>	<u>PERCENT BY WEIGHT PASSING</u>
1 inch	100
¾ inch	90 - 100
⅜ inch	20 - 55
#4	0 - 10
#8	0 - 5

23.10 TYPE 7 - CRUSHED STONE

- A. The crushed stone shall consist of clean, hard, inert, durable particles or fragments. It shall be free from clay, loam, vegetable or other objectionable matter.
- B. At least 50% of the material passing a one (1) inch sieve shall have a fractured face. The percent of wear of the crushed stone for pavement base coarse shall not exceed 50.

The stone sizes for the crushed stone shall be as follows:

<u>SIEVE SIZE</u>	<u>PERCENT BY WEIGHT PASSING</u>
1 ½ inch	100
1 ¼ inch	85 - 100
¾ inch	10 - 40
½ inch	0 - 8

- C. The equipment for producing crushed stone shall be of adequate size and with sufficient adjustments to produce the required materials without unnecessary waste. The plant shall be capable of removing excess sand. The Engineer may order final screening of crushed stone if flat or elongated pieces are present in objectionable amounts.

23.11 PLACING AND COMPACTING

- A. The material shall be placed and compacted as specified in related specification sections.

END OF SECTION

SECTION 31.25.00

SLOPE PROTECTION AND EROSION CONTROL

25.1	SCOPE OF WORK
25.2	RELATED WORK SPECIFIED ELSEWHERE
25.3	SLOPE PROTECTION AND EROSION CONTROL
25.4	SEDIMENTATION POOLS
25.5	SILT FENCES
25.6	STONE LINED WATERWAYS
25.7	PRECONSTRUCTION CONFERENCE
25.8	PROCEDURAL DETAILS
28.9	ACCEPTANCE

25.1 SCOPE OF WORK

- A. This work shall consist of temporary and permanent control measures as shown on the Contract Drawings, as required, or as ordered by the Engineer throughout the construction and post-construction period to control erosion and sedimentation by the use of silt fences, sedimentation pools, check dams, filter fabric and other control devices. The erosion and sediment control features installed by the Contractor shall be satisfactorily maintained by the Contractor.
- B. In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness or failure to install permanent controls as a part of the work scheduled, and such additional measures are ordered by the Engineer, the work shall be performed by the Contractor at his expense.
- C. Repeated failures by the Contractor to control erosion (pollution/siltation) shall be cause for the Engineer to employ outside assistance or to use his own forces to provide the necessary corrective measures. The cost of such assistance plus Engineering costs will be charged to the Contractor and appropriate deductions made from the Contractor's monthly progress estimate.
- D. The Contractor shall remove sediment from behind silt fences, check dams and from sedimentation pools as necessary or as directed by the Engineer.

25.2 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 01.33.00 - SUBMITTALS
- B. SITE WORK

25.3 SLOPE PROTECTION AND EROSION CONTROL

- A. This work shall consist of the design, installation, maintenance and removal of temporary erosion control measures such as mulching slope drains and grasses to control and/or prevent erosion around the construction site during construction. Mulches may be hay, straw, fiber mats, netting or other suitable material acceptable to the Engineer.
- B. Slope drains may be constructed of pipe, fiber mats, or other material acceptable to the Engineer that adequately controls erosion.

- C. Grass shall be a quick growing species (such as rye grass, Italian rye grass, or cereal grasses) suitable to the area providing a temporary cover which will not later compete with the grasses used later for permanent cover.
- D. Fertilizer and soil conditioners shall be a standard commercial grade acceptable to the Engineer.
- E. Hay bales shall be 36" x 18" x 24", or larger, with two 1" x 1" x 48" stakes, per bale, to secure the bale in place.

25.4 SEDIMENTATION POOLS

- A. Sedimentation pools where used shall be constructed to a size and configuration and at locations as approved by the Engineer. The sedimentation pools shall be constructed and operational before excavation, embankment or drainage system construction in the area served by the pool is started. A series of haybales, in a rectangle secured with oak stakes (see attached detail), line with siltation fence, and shall be used to construct a siltation pool. The discharge hose from the trench shall discharge into the pool. Sedimentation pools shall be maintained during and after construction in good hydraulic condition such that function as intended. Pools shall be maintained and kept in operation by the Contractor for the duration of the project. Sediment and other deposits shall be removed when the depth of material reaches 12 inches, or as directed by the Engineer, to ensure satisfactory pool performance. The Contractor shall provide and maintain access to the pools for their maintenance. The pools shall be removed at the completion of the Contract or when directed by the Engineer. All disturbed areas shall be covered with 4 inches of plantable soil borrow and seeded in accordance with the provisions of these Specifications.

25.5 SILT FENCES

- A. This work shall consist of the construction, maintenance and removal of temporary silt fences. The silt fences shall be placed at the location shown on the Contract Drawings or as directed by the Engineer. The silt fences shall be in place before construction in the area begins.
- B. The snow fence should be set in place with a 6" trench on the front side. The filter fabric will be laid loosely on the fence so as not to stretch the material. The panels shall be overlapped a minimum of 12 inches. Suitable tie wire shall be used to secure the cloth to the top of the fence. The bottom of the cloth should be buried in the trench to prevent water from flowing beneath the fence. Fence posts shall be wooden or metal posts set 1 ½ feet into the ground at 6' centers.
- C. The filter fabric shall conform to the following requirements. The yarn shall consist by weight of at least 85 percent vinylidene chloride and shall contain stabilizers added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and/or heat exposure. After weaving, the cloth shall be calendered so that the filaments retain their relative positions with respect to each other. The cloth shall be free of defects or flaws which significantly affect its physical and/or filtering properties. It shall be woven in widths of at least 6 feet and in rolls of not less than 50 linear feet. The sheets of filter cloth shall be sewn together with polypropylene or polyvinylidene chloride at the point of manufacture to form sections not less than 24 feet wide. All edges of the cloth shall be salvaged. During shipment and storage, cloth shall be wrapped with a suitable material for protection against damage.

- D. Should the Contractor desire to use an equal filter fabric sample of the proposed filter fabric shall be furnished 30 days prior to installation of the fabric. Samples, shipping, and cost of testing shall be at the Contractor's expense. A minimum of 5 square yards of cloth a minimum of 36 linear inches of seam, with at least one foot of cloth each side of the seam, shall be furnished for testing. Mill certificates, or affidavits from the manufacturer, shall accompany these samples, citing the trade name and producer of the cloth and certifying that the samples are representative of the material which will be installed on the project and that the cloth meets the requirements stated in this Specification. In addition, a certified copy of permeability and filtration tests from a qualified laboratory showing the performance of filter with various grain size soils and water, giving both particle retentions and permeability, shall be submitted at the request of the Engineer.
- E. Filter fabric shall be handled and placed in accordance with the manufacturer's recommendations. When the fabric is joined by stitching it shall be stitched with a yarn of contrasting color. The size and composition of the yarn shall be as recommended by the fabric manufacturer. The stitches shall number 5 to 7 per inch of seam.
- F. Should the fabric be damaged during placing, the torn or punctured section shall be repaired by placing a piece of fabric that is large enough to cover the damaged area and to meet the overlap requirement.
- G. Damaged sections of the silt fences shall be repaired or replaced by the Contractor for the duration of their use. Sediment shall be removed as directed by the Engineer.
- H. The silt fences shall be removed when adequate vegetative growth insures no further erosion of the slopes or when directed by the Engineer. The filter fabric may be cut at ground level.
- I. All material, including the filter fabric and fence, become the property of the Contractor and shall be disposed of away from the site.

25.6 STONE LINED WATERWAYS

- A. The Contractor shall provide all material, labor, and crushed stone for waterways, consisting of a protective covering of angular shaped stones laid on the waterway to insure protection of the waterway.
- B. The waterway shall be placed to line and grade as shown on the plans or as directed by the Engineer on a prepared bed of crushed stone. Each stone for the waterway shall be carefully placed by hand, normal to the slope and firmly bedded thereon. Each stone shall weigh not less than 50 pounds nor more than 125 pounds and at least 75% of the volume shall consist of stones weighing not less than 75 pounds each. The remainder of the stones shall be so graded that when placed with the larger stones, the entire mass will be compacted with a minimum percentage of voids and a minimum thickness of 6 inches.

25.7 PRECONSTRUCTION CONFERENCE

- A. At the preconstruction conference or prior to the start of the applicable construction, the Contractor shall submit to the Engineer for acceptance, his plans and schedules for accomplishment of temporary and permanent slope protection and erosion control and restoration work, as are applicable for clearing and grubbing and general construction and disposal of unsuitable material and restoration of disturbed land to its original (prior

to construction) condition. No work shall be started until schedules and methods of operations have been approved by the Engineer.

25.8 PROCEDURAL DETAILS

- A. The Engineer shall have the authority to limit the area of erodible earth exposed by construction and to direct the Contractor to provide immediate permanent or temporary erosion control and slope protection measures to prevent sediment runoff to adjacent streams, ponds, or other areas of water impoundment. Such work may involve the construction of temporary mulches, mats, seeding or other control devices or methods as required by the conduct of the work or as directed by the Engineer.
- B. The Contractor shall be required to incorporate all permanent erosion control measures into the project at the earliest practical time as outlined in the approved schedule. Temporary erosion control and slope protection measures will be used to correct conditions that develop during construction that were not foreseen during the design stage.
- C. The Contractor shall undertake and comply with the following measures with respect to adverse environmental impacts, resulting from the operations listed below.
 - 1. Clearing and Grubbing - Disturbed areas shall be re-grassed at the direction of the Engineer.
 - 2. Access Road Construction - Riprap or sodding shall be used to prevent erosion.
 - 3. Material Storage - Materials shall be stored only at approved locations. Petroleum products shall be stored away from wetland areas.
 - 4. Excavation - The Contractor shall use care to contain wet fill where it is dumped. When material is stockpiled next to a trench, the side away from neighboring brooks, swamps, canals, etc., shall be utilized where space is available. Side slopes of stockpiled material shall conform to the natural angle of repose of the soil. The Contractor shall promptly remove all sediment from brooks and swamp areas, if deposition cannot be avoided during construction. The Contractor shall promptly remove excess fill and re-grass the work area. Excess fill shall not be disposed of in wetlands, other than in areas defined on the drawings, or areas approved by commissions or authorities having jurisdiction.
 - 5. Water handling - The Contractor shall be required to use crushed stone or plastic sluiceways leading to brooks to filter pumped discharges.
 - 6. Backfilling - The Contractor shall replace unsuitable material with properly suitable material. He shall also be responsible for surface repairs as required.
 - 7. General - Trash receptacles shall be required on the job site. The Contractor shall perform preliminary clean-up operations as he completes segments of his work.
 - 8. Spillings - Ground spilling of oil or other petroleum products drained from equipment shall be prohibited. The Contractor shall provide leakproof containers for receiving drained oil and shall properly dispose of such oil away from the site of the job.

25.9 ACCEPTANCE

- A. Final inspection and acceptance in regard to cleanup, site restoration, erosion control and sloped protection measures shall be made in the presence of the Owner and/or commissions or authorities having jurisdiction. The Contractor shall notify the Owner in writing of the readiness of the work for final inspection.

END OF SECTION

SECTION 32.12.00 PAVING AND ROAD CONSTRUCTION

- 12.1 CONTRACT DOCUMENTS
- 12.2 DESCRIPTION OF WORK
- 12.3 RELATED WORK SPECIFIED ELSEWHERE
- 12.4 GENERAL CRITERIA
- 12.5 SUBGRADE
- 12.6 SUBBASE
- 12.7 DELETED
- 12.8 HOT MIX ASPHALT (HMA) INTERMEDIATE DENSE BINDER
 - PERMANENT PAVEMENT
- 12.9 HOT MIX ASPHALT (HMA) SURFACE STANDARD TOP COURSE
 - PERMANENT PAVEMENT
- 12.10 SIDEWALKS AND DRIVEWAYS AND CURBS
- 12.11 PAVEMENT EXCAVATION-COLD PLANER
- 12.12 PAVEMENT MARKINGS
- 12.13 HOT MIX ASPHALT (HMA) PAVING – GENERAL
- 12.14 CARE AND RESTORATION OF PROPERTY
- 12.15 PREPARATION OF SUBGRADE IN CUT AREAS
- 12.16 PREPARATION OF SUBGRADE IN FILL AREAS
- 12.17 PREPARATION OF SUBBASE
- 12.18 PAVEMENT MARKINGS
- 12.19 PERMANENT PAVEMENT
- 12.20 MAINTENANCE OF PAVING
- 12.21 SIDEWALKS, DRIVEWAYS AND CURB CONSTRUCTION

12.1 CONTRACT DOCUMENTS

- A. The general provisions of the Contract, including General and Supplemental Conditions and General Requirements, apply to the work specified in this section.
- B. The Contractor shall be responsible for maintaining all pavements and sidewalks placed as part of the Contract, in a safe and satisfactory condition until the project is accepted as complete. For any pavement or sidewalk area damaged, the Contractor shall remove the entire pavement structure in the damaged area and replace it as directed by the Engineer.
- C. Should the application of the wearing surface be delayed for any reason including bad weather, the Contractor shall provide and maintain the base in acceptable condition until such time as the new pavement is place.
- D. During construction, all existing pavement, not to be removed, shall be protected by the Contractor. Any pavement damaged shall be removed and replaced by the Contractor at the Contractor's expense.

12.2 DESCRIPTION OF WORK

- A. Work under this section consists of furnishing all materials, labor, tools, equipment and supervision necessary to restore existing or construct new pavement subgrades, subbase, HMA binder courses, tack coats and HMA surface courses for roadways and all curbs, sidewalks, driveways, and parking areas.

- B. The materials and construction methods used for this work shall conform to the Massachusetts Highway Department, "Standard Specifications for Highways and Bridges", 1988 Edition, and subsequent revisions and addenda.
- C. All temporary construction roads, ditches, and drainage facilities shall be removed and the site restored before completion of the project.

12.3 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 31.00.00 - EARTHWORK
- B. SECTION 31.23.23 - FILL AND BACKFILL MATERIALS
- C. SITE WORK -As Appropriate
- D. CONCRETE - As Appropriate

12.4 GENERAL CRITERIA

- A. The Contractor shall be responsible for obtaining any permits and meeting State requirements for all work taking place in State highways.

12.5 SUBGRADE

- A. Sub-grade shall be either Type 1, 2, 3 or 4 material in accordance with related specifications.

12.6 SUBBASE

- A. Sub-base shall be Type 6 screened gravel material in accordance with related specifications or reclaimed material.

12.7 DELETED

12.8 HOT MIX ASPHALT (HMA) INTERMEDIATE DENSE BINDER
- PERMANENT PAVEMENT

- A. Dense binder course shall be the first layer of bitumen and aggregate mixture overlying the screened gravel sub-base.
- B. Dense binder course shall be HMA Intermediate Dense Binder Course as given in the Massachusetts Highway Department Standard Specifications for Highways and Bridges.

12.9 HOT MIX ASPHALT (HMA) SURFACE STANDARD TOP COURSE
- PERMANENT PAVEMENT

- A. Surface course shall be HMA Surface Standard Top Course Pavement as given in the Massachusetts Highway Department Standard Specifications for Highways and Bridges.

12.10 SIDEWALKS AND DRIVEWAYS

- A. HMA for driveways, curbs (Cape Cod Berms) and sidewalks shall be in accordance with the appropriate section in the Massachusetts Highway Department Standard Specifications for Highways and Bridges.

12.11 PAVEMENT EXCAVATION-COLD PLANER

- A. This work consists of removing pavement by cold planer in designated areas. The cold planer must be equipped with an elevating device capable of loading directly into dump trucks while operative. It shall have all necessary safety devices. Milling shall be done to a depth per plan, to the designated limit of work. Excavation shall be in accordance with MHD Specifications 120.66. The contractor shall dispose of the material cold planed at his expense.

12.12 PAVEMENT MARKINGS

- A. Pavement markings are should be in conformance with MHD Section 860 of Standard Specifications for Highways and Bridges.

12.13 HOT MIX ASPHALT (HMA) PAVING - GENERAL

- A. All mixtures delivered to the job site shall be accompanied by a Certificate of Compliance. Deliveries not accompanied by a certificate will not be used in the work.
- B. Construction methods shall conform to the requirements of the Massachusetts Highway Department Standard Specifications for Highways and Bridges, including the following:
1. Mixtures delivered to the job site shall not possess signs of segregation of ingredients or surface crust.
 2. The temperatures of the mixture when delivered to the spreader will be a minimum of 250 F.
 3. Mixtures shall be placed only upon approved surfaces that are clean from foreign material and are dry; and when weather conditions are suitable. No mixture shall be placed when the weather is foggy or rainy, provided, however, that the Engineer may permit, in the case of sudden rain, the placing of mixture then in transit from the plant, if laid at the proper temperature and if the roadbed is free from pools of water. Such permission shall in no way relax the requirements for the quality of the pavement and smoothness of the surface. No materials shall be placed upon a frozen base, or when wind conditions are such that rapid cooling will prevent satisfactory compaction.
 4. Wherever possible material shall be compacted using steel wheeled rollers.
 5. In areas not accessible to a roller, compaction shall be accomplished by using mechanical compactors or hand tampers, approved by the Engineer.
 6. All material place shall receive final compaction before nightfall of the day placed, unless artificial light, satisfactory to the Engineer, is provided.
 7. The density of completed paving shall not be less than 95% of the density obtained from laboratory compaction of a mixture composed of the same materials in like proportions.
 8. The Engineer may require the Contractor to remove and replace at his own expense, any work deemed defective on the basis of sampling and testing for composition and density, or faulty procedures.

12.14 CARE AND RESTORATION OF PROPERTY

- A. All streets, sidewalks, gutters, driveways and curbs which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations.
- B. Suitable materials and methods shall be used for restoration of curbs and other types of gutters, driveways and sidewalks.
- C. Materials and method of all restoration work shall be subject to approval by the Engineer.
- D. All frames, grates, covers, street boxes, manhole rings and other castings removed or damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations.
- E. All frames, grates, covers, street boxes, manhole rings and other castings within the limits of new paving shall be reset by the Contractor such that they are flush with the new surface.

12.15 PREPARATION OF SUBGRADE IN CUT AREAS

- A. If after excavation to the proposed sub-grade elevation the in situ material is determined by the Engineer to be unsuitable, the Contractor shall excavate an additional 1 foot and backfill with Type 3 sand and gravel compacted to 95% of maximum dry density. Changes in the depths and limits of excavations or fills shall be an appropriate bid adjustment item.
- B. The Contractor shall remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from areas upon which subbase and pavement material will be placed. The subgrade shall be shaped as indicated on the Contract Drawings and shall be compacted to 95% of maximum dry density.

12.16 PREPARATION OF SUBGRADE IN FILL AREAS

- A. The Contractor shall remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from areas upon which embankments will be built or material will be placed for grading.
- B. After the area has been stripped and grubbed as herein specified, Type 1, 2, 3 and 4 material shall be placed thereon and built up in successive layers until it has reached the required elevation.
- C. Layers shall not exceed 6 inches in thickness before compaction. The layers shall be slightly convex toward the center. Layers shall be compacted to 95% of the maximum dry density of the particular material used.

12.17 PREPARATION OF SUBBASE

- A. Subbase material shall conform to Type 6 Screened Gravel or reclaimed material as described in the related sections of the specifications.
- B. Screened gravel subbase for either permanent paving shall be a minimum of 12 inches in thickness.

12.18 PAVEMENT MARKINGS

- A. Pavement markings shall be placed in accordance with MHD Specifications for Bridges and Highways.

12.19 SURFACE PAVEMENT

- A. Surface paving is to be placed after at least 30 days has elapsed for required compaction to have occurred as determined by the Engineer.
- B. Prior to surface paving, the Contractor shall make all final repairs to the previously installed trench paving, and raise for cause to be raised, all existing, manhole, catch basin, valve box, curb box, and utility covers, etc., to conform to the final pavement grade. All loose or damaged material in the existing pavement outside of trench pavements, shall be removed and a leveling course, as herein specified, shall be installed. Leveling course shall also be installed at depths and locations, as directed by the Engineer, to fill existing holes and depressions, or to improve roadway crowns. Leveling course quantities used for surface paving shall be included in the bid.
- C. All areas to receive surface paving shall be dry and thoroughly cleaned of foreign or loose material; a compatible prime or tack coat, shall be applied to the rate of 0.05 to 0.15 gallons per square yard of pavement, depending upon the condition of the existing surface. All castings and edgestones will be protected from the tack coat.
- D. Where curbing is present, the existing pavement shall be planned such that curb reveal shall be substantially the same prior to and following the application of surface paving.

12.20 MAINTENANCE OF PAVING

- A. The Contractor shall maintain pavement placed under this Contract until the expiration of the one year guarantee period and shall promptly fill with similar material all depressions and holes that may occur so as to keep the pavement in a safe and satisfactory condition for traffic.

12.21 SIDEWALKS, DRIVEWAY AND CURB CONSTRUCTION AND RECONSTRUCTION

- A. All HMA berms, sidewalks, and driveways damaged during construction will be reconstructed to their original condition after construction is completed.

END OF SECTION

SECTION 32.16.00 CURB

- 16.1 SCOPE OF WORK
- 16.2 RELATED WORK SPECIFIED ELSEWHERE
- 16.3 BITUMINOUS CURBING
- 16.4 PRECAST CONCRETE CURBING
- 16.5 GRANITE CURBING
- 16.6 SALVAGE OF CURBING
- 16.7 EXCAVATING TRENCH
- 16.8 PREPARATION OF FOUNDATION
- 16.9 SETTING CURBING

- 16.1 SCOPE OF WORK
 - A. Work under this section consists of furnishing all material, labor, tools, equipment, and supervision necessary to install granite curb, curb corners, transition curb, and curb inlets.
 - B. The contractor shall be responsible for removing and resetting existing granite curbing and furnishing and installing new granite curbing, in accordance with these specifications and in close conformity with the lines and grades shown on the Contract Drawings and as approved by the Engineer.

- 16.2 RELATED WORK SPECIFIED ELSEWHERE
 - A. SITE WORK
 - B. CONCRETE

- 16.3 BITUMINOUS CURBING
 - A. New bituminous curbing shall meet the requirements of the Massachusetts Highway Department Standard Specifications for Highways and Bridges, Subsection 501.64 and M3.12.0. Curbing shall be as shown on the contract drawings.

- 16.4 PRECAST CONCRETE CURBING
 - A. New curbing shall meet the requirements of the Massachusetts Highway Department Standard Specifications for Highways and Bridges, Subsection M4.01.14. Curbing shall be as shown on the Contract Drawings. Transition curbing shall be placed at the ends and beginnings of curbing, at drain inlets, and at handicap ramps.

- 16.5 GRANITE CURBING
 - A. New granite curbing shall meet the requirements of the Massachusetts Highway Department Standard Specifications for Highways and Bridges, Subsection 501.40. Vertical Granite curbing shall be Type VA4 or VA5, Sloped Granite Curbing/Granite Edging shall be Type SA or SB as shown on the Contract Drawings. Transition curbing placed at the ends and beginnings of curbing, at drain inlets, and at handicap ramps.
 - B. If curb, curb corners, or curb inlets of different quarries is used, curbing of each quarry shall be segregated and set together to give a uniform appearance.

- 16.6 SALVAGE OF CURBING
 - A. The Contractor shall carefully remove, store, and clean all curbing specified for resetting. The Contractor shall replace all existing curbing that is to be reset which is lost, damaged,

or destroyed because of his operations, at no expense to the Owner.

16.7 EXCAVATING TRENCH

- A. The trench for the curb shall be excavated to a width of eighteen (18) inches. The subgrade of the trench shall be at a depth below the proposed finished grade of the curb equal to six (6) inches plus the depth of the curbstone.

16.8 PREPARATION OF FOUNDATION

- A. The foundation for the curbing shall consist of a cement concrete bed placed on the gravel subbase as shown on the details.
- B. The foundation for curb inlets shall consist of a full bed of Portland cement mortar on the supporting back wall of the catch basin or gutter inlet and with sufficient gravel on each side to support the overhang. The trench for the gravel foundation shall be at least six (6) inches in depth and eighteen (18) inches in width. This trench shall be filled with gravel and thoroughly tamped to the required grade.
- C. The trench for curb corners shall be excavated so that there is a foundation of gravel which, when thoroughly compacted, will be six (6) inches in depth and extending six (6) inches beyond the front and back of the curb corner to the full depth of the foundation.

16.9 SETTING CURBING

- A. Curb and curb corners shall be set on a concrete foundation as shown on the Contract Drawings, and shall be fitted together as closely as possible.
- B. All spaces under the curb and curb corners shall be filled with concrete so that the curb and curb corners will be completely supported throughout their lengths. The curb shall be set to the line and grade required as shown on the plans, unless otherwise directed.

END OF SECTION

SECTION 32.90.00
ESTABLISHMENT OF GROWTH & PLANTINGS

90.1	SCOPE OF WORK
90.2	RELATED WORK SPECIFIED ELSEWHERE
90.3	LOAM BORROW
90.4	TOPSOIL
90.5	LIMESTONE
90.6	FERTILIZER
90.7	GRASS SEED
90.8	TREE PAINT
90.9	GENERAL PLANTING AND NURSERY STOCK
90.10	STAKING, GUYING AND ANCHORING MATERIALS
90.11	LACING LOAM OF TOPSOIL
90.12	TOPSOIL REHANDLED AND SPREAD
90.13	PREPARATION OF AREAS ON WHICH LOAM OR TOPSOIL ARE TO BE PLACED
90.14	SURFACE DRAINAGE AND SEASONAL LIMITS
90.15	ROUGH FINISHED GRADE
90.16	APPLICATION OF LIMESTONE
90.17	APPLICATION OF FERTILIZER FOR GRASS
90.18	SEEDING GRASS
90.19	SEEDING GRASS BY SPRAY MACHINE
90.20	CARE DURING CONSTRUCTION
90.21	REFERTILIZATION AND APPLICATION OF FERTILIZER
90.22	PREPARATION FOR MULCHING
90.23	PLACING MULCH
90.24	LAWN MAINTENANCE
90.25	PLANTING
90.26	ACCEPTANCE
90.27	GUARANTEE

- 90.1 SCOPE OF WORK
- A. The Contractor shall furnish all labor, materials, and equipment necessary to do all loaming and seeding and planting, as indicated on the Contract Drawings and as herein specified.
- 90.2 RELATED WORK SPECIFIED ELSEWHERE
- A. SECTION 01.33.00 – SUBMITTALS
- B. SITE WORK
- 90.3 LOAM BORROW
- A. Loam borrow shall consist of a fertile, friable, natural topsoil typical of the locality, without admixture of subsoil, refuse or other foreign materials, and shall be obtained from a well-drained site. It shall be such a mixture of sand, silt and clay particles as to exhibit sandy and clayey properties in and about equal proportions. It shall be reasonably free of stumps, roots, heavy or stiff clay, stones larger than ½ inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other litter.
- B. Loam borrow for planting trees, shrubs, ground cover, vines and perennials shall be one of the following sandy loams; “course sand loam”, “sandy loam” and “fine sandy loam”: determined by mechanical analysis (ASTM D 422) and based on the “USDA Classification

System” and as defined in this Section. It shall be of uniform composition, without admixture of subsoil.

It shall be free of stones greater than one and one-quarter inches, lumps, plants and their roots, debris and other extraneous matter as determined by the Owner’s Representative. Planting soil for trees, shrubs, groundcover and vines, and perennials shall have the following grain size distribution for material passing the #10 sieve:

<u>Millimeter</u>	<u>Percent Passing by Weight</u>	
	<u>Maximum</u>	<u>Minimum</u>
2	----	100
1	100	80
0.5	87	67
0.25	78	48
0.10	68	30
0.05	55	22
0.002	7	2

1. Maximum size shall be one and one quarter inches largest dimension. The maximum retained on the #10 sieve shall be 25% by weight of the total sample.
2. The ratio of the particle size for 80% passing (D_{80}) to the particle size for 30% passing (D_{30}) shall be 6.0 or less. ($D_{80}/D_{30} < 6.0$)

- C. Loam borrow for lawn/grass areas as described in the Division 2 Section, LAWNS, of this Specification, shall be one of the following loamy sands and sandy loams; “loamy sand”, “loamy fine sand”, “loamy very fine sand”, or “coarse sandy loam”: determined by mechanical analysis (ASTM D 422) and based on the “USDA Classification System” and as defined in this Section. It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than 1.25 inches, lumps, plants and their roots, debris and other extraneous matter as determined by the Owner’s Representative.

Planting soil for lawn areas shall have the following grain size distribution for material passing the #10 (2.0 mm) sieve:

- D. Prior to stripping, the loam shall have demonstrated by the occurrence upon it of healthy crops, grass or other vegetative growth that it is reasonably well drained and that it does not contain toxic amounts of either acid or alkaline elements.

90.4 TOPSOIL

- A. Topsoil shall consist of fertile, friable, natural topsoil, reasonably free of stumps, roots, stiff clay and stones larger than 1" diameter, noxious weeds, sticks, brush or other litter.
- B. Prior to stripping the topsoil from the construction project, it shall have demonstrated by the occurrence upon it of healthy crops, grass or other vegetative growth, that it is reasonably well drained and capable of supporting plant growth. Material classified as topsoil can only be obtained within the project limits.

90.5 LIMESTONE

- A. Limestone shall consist of pulverized limestone obtained by grinding either calcareous or dolomitic limestone so that 95% of the material will pass a #20 sieve and at least 50% of

the material will pass a #100 sieve. The limestone shall have a neutralizing value satisfactory to the Engineer.

- B. Spread limestone at the rate required by soil analysis up to a maximum limit of 200 pounds per 1,000 sq.ft. Should recommendations of soil analysis require greater rates of application than 200 pound per 1,000 sq.ft., a surface application of limestone not in excess of 50 pounds per 1,000 sq.ft. shall be made to the established lawn during the season after Final Acceptance.

90.6 FERTILIZER

- A. Fertilizer shall be complete starter fertilizer, at least 70 percent of the nitrogen of which is derived from natural organic sources of ureaform. It shall contain the following percentages by weight:

Nitrogen 15% Phosphorous 15% Potash 15%

Fertilizer shall be delivered mixed as specified above, in standard size, unopened containers showing weight, analysis, and names of manufacturers. They shall be stored in a weatherproof storage place in such a manner that the fertilizer will be kept dry and its effectiveness shall not be impaired. Fertilizer shall be applied at a rate of 800 pounds per acre.

- B. Fertilizer at the rate and of analysis recommended by the soil analysis. For lawn areas this fertilizer application shall be the first in a series of fertilizer applications made under this Contract. A second and third application of fertilizer for turf areas shall be specified,

90.7 GRASS SEED

- A. Grass seed shall be of the previous year's crop and in no case shall the weed seed content exceed 1 percent by weight. The grass seed shall conform to the requirements of the following tables:

	<u>Proportion</u>	<u>Germination Minimum</u>	<u>Purity Minimum</u>
-Baron Kentucky Bluegrass	50%	85	98
-Creeping Red Fescue	25%	85	98
-Yorktown Rye	25%	90	98

- B. The seeding rate shall be 6 pounds per 1,000 sq.ft. of seeds.

90.8 TREE PAINT

- A. The paint furnished under this specification shall be suitable for application by brushing on sawed, cut or bruised surfaces of living trees, for the purpose of disinfection and protection of these surfaces.

- B. The new materials from which this paint is manufactured shall be as follows:

- 1) Asphalt: Shall conform to the requirements of AASHTO-M 18, Grade A.
- 2) Creosote: Shall be a distillate of coal-gas tar or coke-oven tar.

- 3) Fibrous magnesium silicate pigment: not less than 97% passing through #325 screen.

Composition:

Asphalt	40-70%
Creosote	20-30%
Fibrous Magnesium Silicate	10-15%
Volatile Thinner	0-15%

- C. The proportions of the various ingredients shall be chosen within the above limits to yield a paint of medium brushing consistency.

90.9 GENERAL PLANTING AND NURSERY STOCK

- A. Materials to be used in this work shall conform to "The American Standards of Nursery Stock" as sponsored by the American Association of Nurserymen, Inc. These standards shall determine all requirements of acceptable shrub and seeding nursery stock.
- B. All plants shall be packed so as to arrive at the delivery point in good growing conditions.
- C. Delivery of plants and seedlings shall be made to site, only according to the Contractor's ability to handle and properly care for them.
- D. All nursery stock shall be grown at nurseries in the northern area of the United States.
- E. All nursery stock shall conform to the "American Standards for Nursery Stock" as sponsored by the American Association of Nurserymen, Inc., U.S. Patent Office A60.1-1969.
- F. All plants shall be fully representative of their normal species or varieties unless otherwise specified. All plants must have a good, healthy, well-formed upper growth; a fibrous compact root system; and must be free from disease, injurious insects, mechanical wounds either fresh or healed, broken branches, decay or any other defect; and shall be legible tagged with their proper names.
- G. All plant materials shall be dug with reasonable care and skill immediately previous to shipment. Special precautions shall be taken to avoid any unnecessary injury to or removal of fibrous roots. Each species or variety shall be handled and packed in the approved manner for that particular plant, having regard to the soil and climactic condition at the time and place of digging, transit and delivery, and to the time that will be consumed in transit. All precautions that are customary in good trade practice shall be taken to insure the arrival of the plants at the site of the project in good condition for successful growth.
- H. The roots of bare rooted material shall be carefully protected with wet straw, moss or other suitable material which will insure the arrival of the plants at the site of the work in good condition.
- I. The sizes of these trees shall be as called for on the plans and measurements shall be made by callipering at a point 12 inches above the collar.
- J. Non-flowering trees shall have been transplanted 3 times, the last transplanting within 2 years. With the exception of *Ulmus Americana*, they shall have a single straight leader not cut back. They shall have symmetrical development of strong, healthy branches

beginning 5 feet to 6 feet from the ground; and below this point, the trunk shall be clean for street trees, although park trees will be permitted to branch lower.

- K. Flowering trees shall have been transplanted twice, the last transplanting within 2 years. The trunk shall be clean and straight up to the first branch, which shall be about 4 feet from the ground where directed. Flowering trees shall be balled and burlapped and kept moist for delivery.
- L. Deciduous shrubs shall be fully representative of their species and variety. They shall have been transplanted twice; the last transplanting within 2 years. They shall have 4 to 6 branches coming from the roots, and shall have a well-branched root system and shall be a good weight for the height specified.
- M. Evergreen shrubs shall have been transplanted 3 times, the last transplanting within 2 years. They shall have a good colored top growth and shall be balled and burlapped and kept moist for delivery. Pyramidal type evergreen trees shall have a spread equal to $\frac{3}{4}$ of their height.
- N. Evergreen shrubs shall have been transplanted twice and shall be of the size indicated on the plans and, except where noted, each clump shall have not less than 4 stems. Plants shall be balled and burlapped and kept moist for delivery.

90.10 STAKING, GUYING AND ANCHORING MATERIALS

- A. Stakes for supporting trees shall be of sound wood of uniform shape and size, reasonably free of knots, insects and fungi and capable of standing in the ground at least two years. Unless noted otherwise, stakes shall be 10 feet long of 2 inch by 4 inch normal size. Stakes shall be pointed at one end and stained dark green or other color selected by the Owner's Representative.
- B. Guy Wire and Hose:
 - 1. Guy wire shall be new pliable annealed galvanized soft steel wire of #10 gauge size.
 - 2. Hose to encase wires shall be new two-ply reinforced rubber garden hose not less than $\frac{1}{2}$ inch inside diameter. Color shall be black.
- C. Elastic Webbing, Belting or Tape:
 - 1. Guying system shall be elastic webbing, belting or tape which establishes contact with the trunk of the tree with a broad, smooth surface. Guying system shall not abrade or girdle tree. Submit guying system to the Owner's Representative for review and approval.
 - 2. Safety flagging for diagonal guy wires shall consist of 12" lengths of lumber, 1 in by 3 in nominal dimension, painted with two coats of white enamel paint and fastened to guy wires with screw eyes, galvanized staples, or other suitable hardware.

90.11 PLACING LOAM OR TOPSOIL

- A. The loam or the topsoil obtained from stacked piles shall be hauled, deposited and spread to the directed depths on the areas shown on the plans or designated by the Engineer. The loam or topsoil shall be spread to a depth of not less than 4 in. All grass and weed growth on the areas designated to be loamed, shall be cut to a maximum height of 2 inches before the loam is placed thereon. After the loam or topsoil has been spread, it shall be carefully prepared by spading or harrowing, and lumps, large stones, brush, roots, stumps, litter and other foreign material shall be removed from the loamed, topsoil or processed planting materials areas and disposed satisfactorily.

- B. The compaction shall be equivalent to that produced by a hand roller weighing from 75 to 100 pounds per foot of width. The compaction may be obtained by rolling, dragging or any method that produces satisfactory results. All depressions caused by settlement or rolling shall be filled with additional materials and the surfaces shall be regraded and rolled until it presents a reasonably smooth and even finish and is up to the required grade.
- C. During hauling operations, the roadway surface shall be kept clean and any loam or other dirt which may be brought upon the surface shall be removed promptly and thoroughly before it becomes compacted by traffic. If necessary, the wheels of all vehicles used for hauling shall be cleaned frequently and kept clean to avoid bringing any dirt upon the surface. The Contractor shall take all reasonable precautions to avoid injury to existing or planted growth.

90.12 TOPSOIL REHANDLED AND SPREAD

- A. Topsoil which is obtained on the site, from piles of topsoil previously excavated and stacked and designated as topsoil to be re-handled and spread, shall be used as required, and as directed by the Engineer, on areas to be seeded. The topsoil must be approved before it is spread and the Contractor will be required, without compensation, to take corrective action as directed, in order to make the topsoil suitable for its intended use.
- B. The Contractor is required to adjust the acidity by the addition of limestone as determined by testing as required and to apply the fertilizer as required.

90.13 PREPARATION OF AREAS ON WHICH LOAM OR TOPSOIL ARE TO BE PLACED

- A. The area upon which the above materials are to be placed shall be raked, harrowed or dragged to form a reasonably smooth surface, all stones larger than 2 inches, undesirable growth over 2 inches and debris shall be removed from the area and disposed of by the Contractor outside the location.
- B. When directed by the Engineer, additional suitable material shall be spread as required to repair gullies or depressions. The labor, equipment and materials necessary to place, compact and grade the additional material shall be paid for under the respective item from which the material is obtained.
- C. The Contractor shall not proceed with the work of seeding until permission of the Engineer has been obtained.
- D. Before the application of limestone, fertilizer and seed, the Contractor shall harrow or rototill to a depth of 3 inches, when directed, all areas where loam or topsoil has been placed under a previous contract. When loams borrow is placed, or topsoil is re-handled and spread; and they are paid for under the respective items of a contract, they will not require harrowing or rototilling.
- E. The Contractor shall remove all debris and stones having any dimensions greater than 2 inches before the application of limestone, fertilizer and seed.

90.14 SURFACE DRAINAGE AND SEASONAL LIMITS

- A. The Contractor shall provide and maintain uniform grades, slopes, crowns and ditches on all excavations and fills to insure satisfactory drainage at all times during the construction period.

- B. The Contractor shall be responsible for protecting adjacent properties, completed work and work in progress from siltation and mud. Finished grades and surfaces for all work under this heading shall shed water to catch basins as per drawings.
- C. No fill material or topsoil shall be placed, spread or rolled during unfavorable weather conditions such as interruption by heavy rains. Fill operations shall not be resumed until approved by the Engineer.

90.15 ROUGH FINISHED GRADE

- A. Grading shall be accomplished as necessary to bring topsoil and sand surfaces to grades shown on the drawings or to prepare the subgrade to receive paving or construction as specified or shown on drawings.
- B. After completion of pavements and structures, surfaces of earth mounds and planting areas shall be rough finished graded and shaped by blading, dragging or other means. Surfaces shall be uniform and smooth, true to slopes and grades. Soils in plating areas shall be graded level with the edge of header boards, pavement or walks. Particular attention shall be given to surface drainage around sump catch basins.
- C. The rough finished surface of the grading plane at any point shall not vary more than 0.10 feet above or below the grade indicated on the drawings.
- D. Upon completion of earthwork, the Contractor shall remove all surplus construction materials, earth and debris resulting from his work so that the entire job site is left in a neat and orderly condition.

90.16 APPLICATION OF LIMESTONE

- A. Limestone may be applied in dry form or hydraulically. Limestone where necessary shall be spread and thoroughly incorporated in the layer of loam or topsoil to adjust the acidity of the loam or topsoil. The rate of application of the limestone will vary up to a maximum of 1 pound per square yard depending on the results of laboratory tests performed by an independent professional testing laboratory acceptable to the Engineer, at the Contractor's own expense. The limestone shall be thoroughly incorporated into the layer of loam or topsoil and the upper 1-inch of the underlying subsoil by harrowing or other methods satisfactory to the Engineer so as to provide a layer of thoroughly mixed material for the seedbed.

90.17 APPLICATION OF FERTILIZER FOR GRASS

- A. Fertilizer may be applied in dry form or hydraulically. After the application in dry form or hydraulically. After the application of limestone, if found necessary, on the seed bed, fertilizer shall be spread on the top layer of loam or topsoil at the rate of 800 pounds per acre and worked into the seed bed. The full depth of loam or topsoil shall then be spaded or harrowed and graded to the required cross-section.

90.18 SEEDING GRASS

- A. After the loamed or topsoil areas have been prepared and treated as before described, grass seed conforming to the respective formulas before specified shall be carefully sown thereon at the rate of approximately 175 pounds per acre. Seeding shall be done in two directions at right angles to each other. Seeding on level areas and on slopes up to and including 4:1 slopes shall be done by means of an approved seeder that will seed and roll in one operation. On shoulders and other narrow areas, the seeding may be done longitudinally in one application.

90.19 SEEDING GRASS BY SPRAY MACHINE

- A. The spray machine will be restricted for use only on slopes steeper than 4:1. The application of limestone as necessary, fertilizer and grass seed may be accomplished in one operation by the use of limestone as necessary, fertilizer and grass seed may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area the resulting deposits of limestone, fertilizer and grass seed shall be equal in quantity to those quantities specified before.
- B. A certified statement shall be furnished, prior to start of work, to the Engineer by the Contractor as to the number of pounds of limestone, fertilizer, and grass seed, per 100 gallons of water.
- C. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above. If the results of the spray operation are unsatisfactory, the Contractor will be required to abandon this method and to apply the limestone, fertilizer and seed as before specified.

90.20 CARE DURING CONSTRUCTION

- A. The Contractor shall be responsible for the watering of all seeded and grassed areas which shall be kept moist. The Engineer's decision will prevail in the event a dispute develops with the Contractor as to whether or not the seeded and grassed areas are moist. Seeded areas on which growth has started shall be watered to a minimum depth of 2 inches to assure continuing growth. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment to apply one complete coverage to the seeded areas in an 8 hour period.
- B. If necessary, suitable signs and barricades of brush or other materials shall be placed to protect the seeded areas. After the grass has appeared, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be seeded repeatedly until all areas are covered with a satisfactory growth of grass.
- C. The Contractor shall care for all of the seeded areas until the work has been physically accepted, without compensation in addition to the amount regularly to be paid under this item as hereinafter provided. Care shall include all re-grading, re-fertilizing, reseeding and mowing which may be necessary.
- D. Prior to the acceptance of the project the Contractor will be responsible for mowing the grass when necessary on all flat or rolling slopes from level to and including 4 to 1 slopes to a height of 3 inches when the grass has attained a height of eight inches. The grass on all slopes steeper than 4 to 1 shall be cut when necessary to a height of 3 inches at such a time as a stable turf has been established in the Engineer's judgement.

90.21 REFERTILIZATION AND APPLICATION OF FERTILIZER

- A. This work shall be done in April, May, August or September. No permission will be granted to re-fertilize in months other than herein prescribed. Areas recently seeded shall be re-fertilized only after one season of growth of two months duration.
- B. The fertilizer shall have a composition of 10-10-10 and be applied at a rate of 500 pounds per acre. In addition, organic fertilizer derived from any commercial source shall be

applied at the rate of 135 pounds of N per acre. Seed as before specified shall be included with the fertilizer at a rate of 10 pounds per acre.

90.22 PREPARATION FOR MULCHING

- A. The areas upon which mulch is to be spread shall be prepared by raking, harrowing or dragging to form a reasonably smooth surface. All stones larger than 2", undesirable growth over 2' in height and all debris shall be removed from the area and disposed by the Contractor in a satisfactory manner. The disposal area shall be outside the location limits of the project, when required by the Engineer and shall be responsibility of the Contractor.
- B. When required by the Engineer, the Contractor shall spread, compact and grade additional acceptable material to repair gullies or depressions. Such additional material shall be obtained from suitable excavation or furnished by the Contractor.

90.23 PLACING MULCH

- A. Hay mulch shall be loosely spread to a uniform depth over all areas designated on the plans, at the rate of 4 ½ tons per acre. Hay mulch may be applied by mechanical apparatus, if in the judgement of the Engineer the apparatus spreads the mulch uniformly and forms a suitable mat to control slope erosion. The apparatus shall be capable of spreading at least 80% of the hay or straw in lengths of 6" or more, otherwise it shall be spread by hand.
- B. Wood chip mulch and aged pine bark mulch shall be loosely spread to uniform depth over all acres designated on the plans, at the rate of 390 cubic yards per acre (approximately 3" in depth), or as otherwise directed.
- C. Wood chip mulch and aged pine bark mulch may be applied by mechanical means, except that if the equipment breaks the mulch into small pieces or changes its desired texture, as determined by the Engineer, it shall be spread by hand.

90.24 LAWN MAINTENANCE

- A. Maintenance shall begin immediately after any area is seeded and shall continue for a sixty (60) day active growing period for seeded areas or until Final Acceptance, whichever is longer; following the completion of all lawn construction work, and until final acceptance of the project. In the event that seeding operations are completed too late in the fall for adequate germination and growth of grass, then maintenance shall continue until the following spring for the minimum sixty (60) day period. In addition, install blankets or netting to prevent loam degradation and movement over the winter. Submit product literature and samples to the Owner's Representative for review. Blankets and netting shall be placed in a timely manner at no additional cost to the Owner.
- B. Maintenance shall include reseeding, mowing, watering, weeding, fertilizing a minimum of two (2) times in addition to the fertilizer incorporated by harrowing into the spread loam, and resetting and straightening of protective barriers. Lawn work maintenance shall also include chemical treatments as required for fungus and/or pest control.
- C. During the maintenance period, any decline in the condition of seeded areas shall require immediate action to identify potential problems and to undertake corrective measures.

D. Watering shall be done in manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment.

1. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary to maintain moist soil to a depth of at least two (2) inches for seeded areas. At no time shall a tank truck be allowed on the seeded beds.
2. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply water to the required soil depths each eight (8) hour period.

E. Mowing and Edging

1. The Contractor shall keep lawn areas mowed until Acceptance of the contract by cutting to a height of two (2) inches when growth reaches three (3) inches or as directed by the Owner's Representative.
2. At each mowing, all edges of walks, drives, plant beds and other border conditions shall be trimmed by hand or machine to produce straight and uniform edge conditions.
3. Remove and discard from paved areas only clipping and debris generated by each mowing and edging operation legally off-site. Owner's Representative, if practical and aesthetic, may allow sweeping (not blowing) clipping back into grass. Mowers shall be equipped with mulching blades. Do not remove from grass areas any clippings that have been generated by mowing operations. Do not mow grass when wet.

90.25 PLANTING

- A. Furnishing and planting of plant material shall include, but shall not be limited to, the digging of planting pits and plant beds, amendment of loam as required to produce planting soil mix, provision of soil additives required to adjust for pH requirements of specific plants, furnishing the plants as specified as well as the labor of planting, fertilizing, and maintenance.
- B. The Contractor shall locate plant material sources and ensure that plants are shipped in timely fashion for installation.
- C. Contractor shall locate all existing underground utilities that are within ten (10) feet of the proposed planting pits and notify the Owner's Representative of any conflicts prior to digging plant pits.
- D. Seasons for Planting:
 1. Spring: Deciduous materials – March 21 through May 1; Evergreen materials – April 15 through June 1.
 2. Fall: Deciduous materials – October 1 through December 1; Evergreen materials – August 15 through October 15.
- E. Planting

1. Notify the Owner's Representative three (3) working days prior to the proposed arrival of plant material on the site. If not planted within twenty four (24) hours of delivery to the site, all plants shall be maintained in an on-site nursery. Container grown shrubs stored on site shall be shaded from direct sunlight at all times and shall not be stored directly on paved surfaces. All plants delivered to the site and not planted within twenty four (24) hours of delivery shall have their root balls covered with mulch and shall be watered on a daily basis such that root balls are kept moist throughout.
 2. Locations for all plants and outlines for planting areas shall be staked on the ground by the Contractor for approval by the Owner's Representative before any plan pits or plant beds are dug. Notify the Owner's Representative no less than three (3) days prior to desired date of inspection of staking to schedule a site visit.
 3. Circular plant pits shall not be required provided that the minimum dimension between the edge of the pit and the face of the root ball is not less than required.
 4. All plant pits dug with a machine shall have the sides of the holes scraped with hand shovels to prevent glazing or compaction of the sides of the hole. Remove and stockpile excavated loam for reuse as backfill for plant pit. All subsoil excavated from the bottoms of planting pits shall be removed from the site.
 5. Plant pits shall be dug to the dimensions shown on the Contract Documents.
 - a) Plant pits for trees shall be a minimum six (6) feet greater in diameter than the diameter of the root ball. Place root ball directly on sub-grade. Slope sides of tree pits at a 45-degree angle.
 - b) Plant pits for shrubs shall be two (2) feet greater in diameter than the diameter of the root ball. Place root ball directly on sub-grade. Slope sides of plant pits at a 45-degree angle.
 - c) Shrub planting beds shall be excavated and backfilled with planting soil mix to a minimum uniform depth of eighteen (18) inches below final grade, or as shown on the Contract Documents.
 - d) Plant pits shall be dug to the depth of the root ball to be planted. Remove all soil from around the root flare of the stem of the plant and from the top of the root ball to determine the true depth of the root ball. All plants that have been planted and have root flares that are buried will be rejected.
 6. All plant roots and earth balls must be damp and thoroughly protected from sun and wind from the beginning of the digging operation, during transportation, and at the site until the final planting.
 - a) Mycorrhizal fungal inoculants shall be added to the plant pits according to plant size.
 - b) The application rates for mycorrhizal fungal packets shall be in accordance with the manufacturer's recommendations.
 - c) Submit the purchasing receipt showing the total quantity purchased for the project prior to installation. Submit empty packets of fungal spore inoculants to the Owner's Representative for verification of use. Owner's Representative will excavate tree pits to determine presence of mycorrhizal fungal inoculants.
- F. All plants shall be watered immediately following planting as necessary to thoroughly moisten root ball and plant pit loam and thereafter shall be inspected frequently for

watering needs and watered, as required, to provide adequate moisture in the planting pit. The Contractor shall inspect three pits twenty four (24) hours after initial watering to confirm that they are draining properly. If surface water or excessively saturated plant pit soils exist, the Contractor shall immediately notify the Owner's Representative. The Owner's Representative will recommend remedial measures based upon site conditions.

90.26

ACCEPTANCE

- A. Upon the completion of all planting work, the Contractor shall request in writing that the Owner's Representative formally inspect the planting work.
- B. If plant materials and workmanship are acceptable, the Owner's Representative will issue a written Certificate of Conditional Acceptance to the Contractor.
- C. Following the issuance of the Certificate of Conditional Acceptance to the Contractor, the Contractor shall maintain the plants for a minimum thirty (30) day Monitoring Period. At the end of the Monitoring Period, the plant material will be inspected by the Owner's Representative to determine whether or not all planting work has been performed to the requirements.
- D. Acceptance Standards at end of the Monitoring Period: If plant material is reviewed when it is in full leaf, leaves shall be plump with water with a shape indicative of the species and shall be free of insect, pest and disease damage. Twigs shall have living cambium for their full length. Twigs and branches shall have a full bud set for their full length, including terminal buds. Trunks and branches shall be free of frost cracks; sun scald; damage due to insects, pests, and disease; structural defects; and damage resulting from machinery or tools. Plant material inspected and reviewed when the plants are not in full leaf shall have twigs, branches and trunks meeting the above requirements. All plants regardless of the season of review shall have a minimum of seventy five percent (75%) healthy, balanced branching structure with a healthy terminal leader(s) with viable terminal bud(s).
- E. If any number of plants do not meet these Acceptance Standards at the time of inspection, or if in the Owner's Representative's opinion, workmanship is unacceptable, written notice will be given by the Owner's Representative to the Contractor in the form of a punch list, which itemizes necessary planting replacements and/or other deficiencies to be remedied.

The Contractor's responsibility for maintenance of all plants shall be extended until replacements are made or other deficiencies are corrected.

All plants that do not meet these Acceptance Standards shall be removed from the project within seven (7) days of receipt of the punch list. Replacements shall conform in all respects to the Specifications for new plants and shall be planted in the same manner.

- F. Following the correction of all Punch List deficiencies, the Contractor shall request in writing that the Owner's Representative formally inspect the planting work. If plant materials and workmanship are acceptable, the Owner's Representative will issue a written Certificate of Final Acceptance to the Contractor.

90.27

GUARANTEE

- A. The date of the Certificate of Final Acceptance shall establish the beginning of the maintenance period and the commencement of the required one-year guarantee and establishment period for planting work.

- B. At the end of the guarantee and establishment period, a final inspection will be held to determine whether any plant material replacements are required. Each plant shall be plumb, shall have a character that is natural for its species as determined by the Owner's Representative, and shall conform to the Acceptance Standards. Plants found to be unacceptable shall be removed promptly from the site and replaced. A final inspection will be made after the replacement plant have lived through one (1) year.
- C. At the end of the one (1) year guarantee and establishment period, remove all the tress stakes, guys, or anchors installed on trees during the course of the work of this contract.
- D. All replacements shall be plants of the same kind and size specified in the PLANT LIST. The cost shall be borne by the Contractor, except for possible replacements due to vandalism or neglect on the part of others.

END OF SECTION

SECTION 33.11.14

CONNECTIONS TO EXISTING WATER MAINS

PART 1 GENERAL

- 1.01 DESCRIPTION
- 1.02 RELATED WORK SPECIFIED ELSEWHERE

PART 2 MATERIALS: NOT APPLICABLE

PART 3 EXECUTION

- 3.01 CONTRACTOR OPERATIONS
- 3.02 TAPPING CONNECTION TO EXISTING MAINS

PART 1 GENERAL

- 1.01 DESCRIPTION

- A. Work Included:

This section covers connections to the existing water mains, complete. The Contractor shall furnish all pipe, fittings, valves, tapping machines, if required, and appurtenances. The Contractor shall do all excavation and backfill as required.

- 1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 33.11.14 - DUCTILE IRON PIPE AND FITTINGS

- B. SECTION 33.12.00 – PIPING SPECIALTIES

PART 2 MATERIALS: NOT APPLICABLE

PART 3 EXECUTION

- 3.01 CONTRACTOR OPERATIONS

- A. The Contractor shall make all connections to the existing mains as indicated on the drawings and as herein specified.

- B. The Contractor shall develop a program for the construction and putting into service of the new work subject to the approval of the Engineer. All work involving cutting into and connecting to the existing work shall be planned so as to interfere with operation of the existing facilities for the shortest period possible time and when demands on the system best permit such interference even to the extent of working outside of normal working hours to meet these requirements.

- C. The Contractor shall have all possible preparatory work done prior to making the connection and shall provide all labor, tools, material and equipment required to do the work in one continuous operation.

- D. The Contractor shall have no claim for additional compensation, by reason of delay or inconvenience, for adapting his operations to the needs of the Owner's water supply. No damages shall be claimed by the Contractor for delays in dewatering pipelines nor shall any damages be claimed because of water leaking through closed valves after dewatering is completed.

- E. Under no circumstances shall any customers be without water for a period of more than four (4) hours without prior approval of the Owner. Should it appear that any customer will be without water for more than four (4) hours, the Contractor shall install temporary water service where directed by the Engineer.
- F. Existing pipeline that is not to be abandoned but is damaged by the Contractor during the work shall be replaced by him at his own expense in a manner approved by the Engineer.

3.02 TAPPING CONNECTION TO EXISTING MAINS:

- A. Tapping connections to the existing mains, where indicated on the drawings, shall be made with service pressure in the main, using tapping sleeves and valves and a suitable tapping machine.
- B. Other connections to existing mains shall be made with the main out of service, unless otherwise directed by the Engineer. Such connections will not require tapping sleeves and valves but connections as indicated on the drawings.

END OF SECTION

SECTION 33.03.00

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- 03.1 SCOPE OF WORK
 - 03.2 RELATED WORK SPECIFIED ELSEWHERE
 - 03.3 PVC - PRESSURE PIPE
 - 03.4 PVC - GRAVITY SEWER
 - 03.5 PUSH - ON JOINTS
 - 03.6 PVC BELL (INTEGRALLY CAST)
 - 03.7 SOLVENT WELD JOINT
 - 03.8 PIPE MARKINGS
 - 03.9 HANDLING AND CUTTING PIPE
 - 03.10 PIPE BEDDING
 - 03.11 INSTALLATION OF PIPE
 - 03.12 PIPE ENCASEMENT
 - 03.13 SEWER REPLACEMENT
-
- 03.1 SCOPE OF WORK
 - A. The Contractor shall furnish all labor, tools, equipment, materials, and services necessary to lay, join and test all PVC pipe and fittings, and appurtenant materials as shown on the Contract Drawings and as specified herein.
 - 03.2 RELATED WORK SPECIFIED ELSEWHERE
 - A. SECTION 31.00.00 - EARTHWORK
 - B. SECTION 31.23.23 - FILL & BACKFILL
 - 03.3 PVC - PRESSURE PIPE
 - A. The PVC pressure pipe shall be Class 150 or SDR21 unless otherwise specified and conform to ANSI/AWWA C-900 standard for PVC Pressure Pipe. PVC pipe shall meet the criteria of ASTM D-2241 "Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)". PVC Class 150 Pipe shall be manufactured to dimensions of standard Cast Iron Pipe outside diameters instead of dimensioning according to Iron Pipe Standards (I.P.S.). PVC pipe shall meet all requirement of Uni-Bell Standard Uni-B-2-72. Class 150 pipe & couplings shall meet the following requirements:

<u>PHYSICAL PROPERTY</u>	<u>REQUIREMENT</u>	<u>TEST METHOD</u>
90 second Minimum Burst Pressure	755 PSI	ASTM D-1599
Sustained Pressure	500 PSI	ASTM D-1598 ASTM D-2241
Impact	100 Ft. - lbs.	ASTM D-2244
Hydrostatic Integrity	Non-Failure	ANSI/AWWA C 900-81 Section 3.1.1
Flattening	Non-Failure	ASTM D-2412
Extrusion Quality	Non-Failure	ASTM D-2152
Coupling Pressure Seal	Non-Failure of Seal	ASTM D-3139

03.4 PVC PIPE - GRAVITY SEWER

- A. PVC gravity sewer 8" through 15" shall be SDR 35 unless otherwise specified and shall conform to ASTM D3034 Standard for PVC pipe. PVC gravity Sewer pipe 18" through 27" shall be Type 1 heavy wall unless otherwise specified and shall conform to ASTM F679-80 standard for PVC pipe. The PVC pipe shall be supplied in lengths of 13 or 20 feet.
- B. Except as indicated differently on the Contract Drawings or in the specifications or where specifically directed by the Engineer, gravity sewer pipe shall be furnished with standard integral bell and spigot ends and elastomeric gasket joint.
- C. PVC gravity sewer tees, wyes and tee wyes to be used for service connections shall be PVC SDR 35 fittings with ring tite joints. All fittings shall be capped.

03.5 PUSH-ON JOINTS

- A. Push-on joints shall consist of 1) a single continuous, molded, rubber, ring gasket, 2) a bell socket cast integrally with the pipe or fitting and 3) a pipe or fitting plain end. The configuration shall be such that when the plain end is inserted into the pipe fitting socket the gasket shall compressed radially to form a positive seal. The gasket and annular space shall be so designed and shaped that the gasket is locked in place after the plain end is inserted into the fitting socket.
- B. Push-on joints shall have the same pressure rating as the pipe or fitting of which they are a part.
- C. Gaskets for push-on joints shall be vulcanized natural or synthetic rubber. All gaskets shall be free of porous areas, foreign material and visible defects.

03.6 PVC BELL (INTEGRALLY CAST)

- A. The bell shall consist of an integral wall section with locked-in, solid cross section elastomeric ring which meets the requirements of ASTM F-477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C-900.

03.7 SOLVENT WELD JOINTS

- A. Where solvent weld joints are required they shall be made with solvent supplied by the pipe manufacturer's specifications or with ASTM Recommended Practice D2855. The dry fit of joints shall be snug; pipe and fittings which afford loose fits will be rejected by the Engineer. The use of multiple layers of filler solvent to overcome a loose fit will not be permitted. Solvent cements shall conform to ASTM D-2564.

03.8 PIPE MARKINGS

- A. Pipe and couplings shall bear identification markings that will remain legible during normal handling, storage, installation and during the life of the pipe. Markings shall have been applied to the pipe and couplings in a manner which will not reduce strength or durability or otherwise damage the pipe.
- B. Markings for pressure pipe shall be applied at intervals of not more than 5 Feet and shall include the following: nominal size and OD base, "PVC", dimension-ratio number, AWWA pressure class, AWWA designation number for AWWA C-900, manufacturer's name or trademark and production record code, and mark or seal of pipe testing agency.

03.9 HANDLING AND CUTTING PIPE

- A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring its surfaces and ends.
- B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be at least 12 inches from the visible limits of the crack.
- D. All cutting of PVC pipe is to be square. The pipe to be cut shall be marked around its entire circumference prior to cutting.
- E. Using a factory finished beveled end as a guide to determine the angle and length of the taper, the end of a freshly cut pipe shall be beveled similarly.

03.10 PIPE BEDDING

- A. Pipe bedding and foundation design shall be as specified in related sections.

03.11 INSTALLATION OF PIPE

- A. Standard laying lengths shall be 20 feet for pressure pipe with 85% of the total footage of pipe being full lengths and the remaining 15% being furnished as random lengths. Random lengths shall not be less than 10 feet long. Standard laying lengths for gravity sewer shall be 13 feet.
- B. Prior to assembling, the bell and plain end shall be cleaned of all foreign matter. Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant, supplied by the pipe manufacturer, uniformly over the inner surface of the gasket which will be in contact with the spigot end

of the pipe. The end of the plain pipe shall be chamfered to facilitate assembly. The end shall be inserted into the gasket and then forced passed it until it seats against the bottom of the socket.

- C. Pipe shall be installed in such a manner that will ensure that external loads will not subsequently cause a deflection of greater than 5% in the vertical cross-section dimension.
- D. For PVC pressure pipe horizontal deflection from joint to joint shall be limited to 12 inches for PVC pipe sizes 6 inches to 12 inches based on 16 foot length.
- E. The bedding of the pipe shall conform to the trench detail as shown on the Contract Drawings. Installation precautions are also given in ASTM D 2774.
- F. DELETED
- G. Installed pipe shall rest flat and straight on the bedding at all locations without bridging or binding. Backfill shall be carefully placed to avoid damage to the pipe. The pipe shall be placed to the grades shown on Contract Drawings.
- H. Only laborers competent in laying plastic pipe and suitable equipment shall be employed. Pipe and fittings shall be handled with care so as to prevent scratching or other damage to the materials. All joints shall be properly cleaned and free of foreign matter. The installation instructions of the manufacturer shall be strictly followed with the exception that the pipe bedding shall be as shown on the Contract Drawings.
- I. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, hammer, or other unyielding object. When each pipe has been properly bedded, enough of the backfill material shall be placed and compacted between the pipe and the sides of the trench to hold the pipe in correct alignment.
- J. Before a joint is made, the pipe shall be checked to insure that a close joint with the next adjoining pipe has been maintained and that inverts are matched and form to the required grade.
- K. The Contractor shall take all necessary precautions to prevent flotation of the pipe from trench flooding. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary water-tight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.
- L. Any defective pipe or fitting found in the line shall be removed and replaced without cost to the Owner. All pipes and fittings shall be kept clean of all dirt and debris before being laid, and shall be kept clean until acceptance.

03.12 PIPE ENCASEMENT

- A. Concrete encasement of the PVC Pipe shall be conducted as specified herein or as shown on the Contract Drawings. Concrete requirements for such encasement shall be specified in related sections.

03.13 SEWER REPLACEMENT

- A. The Contractor shall take the necessary precautions to support and protect existing sewer pipes from being damaged during construction of new the water main.

- B. Sewer pipes that are shown on the contract drawings or located in the field and are damaged by the Contractor shall be replaced with PVC pipe at the Contractor's expense.
- C. Should the Engineer feel that PVC is insufficient for use as a replacement pipe, based on field conditions, a different pipe material such as ductile iron pipe may be specified as directed by the Engineer.
- D. The size of the replacement pipe shall closely approximate the size of the existing section to be replaced, allowing a watertight joint to be made while maintaining the existing pipe slope.
- E. Joints between the existing pipe and replacement pipe shall be made with suitable watertight sleeve or couplings.
- F. Joints shall not be backfilled until approved for water-tightness by the Engineer.

END OF SECTION

SECTION 33.05.50.41 PIPING SPECIALTIES

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41.3	MATERIALS
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	B. Pipe Insulation
	C. Butterfly Valves
	D. "Dresser" Couplings
	E. Insertion Valves
	F. Tapping Sleeves and Valves
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	H. Corporation Stops
	I. Curb Stops
	J. Curb Boxes
	K. Hydrant Assemblies
	L. Gate Valves
	M. Valve Boxes

<u>PART 3</u>	<u>EXECUTION</u>
41.4	INSPECTION
41.5	PREPARATION
41.6	INSTALLATION

PART 1 GENERAL

41.1 DESCRIPTION

A. Work Included

Furnish all labor, materials, equipment and incidentals required to install all gate valves, valves, check valves, solenoid valves, couplings, complete as shown on the Drawings and/or as specified herein.

41.2 APPROVAL OF MATERIAL

- A. Submit to the Engineer within ten days after execution of the Contract a list of materials to be furnished, the name of the suppliers and the date of delivery of materials to the job site.
- B. Contractor shall provide to Engineer a sworn affidavit upon receipt of valves that they comply with all applicable provisions of the reference standards and the other provisions of these specifications including the coating requirements.

PART 2 PRODUCTS

41.3 MATERIALS

A. Concrete for Thrusts Blocks

1. Thrust blocks shall be cement blocks as specified on the construction drawings.

B. Pipe Insulation

1. The insulation shall be flame retardant, extruded polystyrene, wired on with No. 18 copper wire on 150 mm centers. The covering shall be an aluminum jacket 0.4 mm thick min., with lock-on type joints and a polycraft moisture barrier secured in place by 12.5 mm stainless steel strapping on 450 mm centers. The joint shall be sealed with Miracle Adhesive FO 400 Sealer; Foster Foamseal 30-45; Cad-a-Seal 745 or equal.
2. The Contractor shall furnish the insulation manufacturer with the exact dimensions of the pipe to be insulated, together with the type of couplings and specials to be used.
3. The insulation material shall be cut to fit the pipe so as to give a continuous thickness. The insulation shall then be wired on with No. 18 copper wire on 150 mm centers. All joints shall be sealed, and with 75 mm overlaps will be secured in place by 12.5 mm stainless steel strapping of 450 mm centers. All fittings, valves and flanges shall be insulated with the same materials securely held in place. All jacket overlaps shall be sealed and waterproofed with a sealant as noted above, or equal. The work shall be accomplished to the satisfaction of the Owner and the Engineer

INSULATION THICKNESS		WATER OR SEWER MAIN DIAMETER	
XX = MM		YY = DIAMETER	
02	50 mm	04	4 NPS
03	75 mm	06	6 NPS
04	100 mm	08	8 NPS
05	125 mm	10	10 NPS
		12	12 NPS
		14	14 NPS
		16	16 NPS
		18	18 NPS
		20	20 NPS
		24	24 NPS
		30	30 NPS
		36	36 NPS
		42	42 NPS
		48	48 NPS
		54	54 NPS
		60	60 NPS

C. Butterfly Valves

Butterfly Valves and operators shall conform to the requirements of AWWA C504 and with the specific requirements and exceptions to AWWA C504 which follow:

1. Manual operator shall be submersible, worn gear type (Philadelphia Gear or equal) rack and pinion traveling nut type on lead screw type suitable for buried service.
2. All operators shall have positive adjustable stops to prevent over-traveling of the disc in the open or closed positions.
3. Operators shall be equipped with two inch square operating nuts, fully gasketed and lubricated for buried service.
4. Gearing shall be totally enclosed, air tight and permanently sealed.
5. Valves up to and including 12 inch diameter shall have a rated working pressure of 200 psi. Valves larger than 12 inch shall have a rated working pressure of 150 psi.
6. The exterior of all valves shall be coated with a minimum of three applications of an approved bituminous solution over a rust free casting prior to shipment. Body rings shall be free of bitumen or defect.
7. Valve interiors shall have a 100 percent solid heat cured or fusion bonded epoxy coating system in accordance with AWWA C550.
8. The location and arrangement of the operator shall be as shown on the plans. The operator shall be designed to hold the valve disc on any intermediate position between fully opened and fully closed without creeping or fluttering. It shall be furnished with a device such as an input shaft lock device to hold the valve in a fixed position for an extended period. Valve operating mechanism shall be capable of transmitting sufficient torque to open and close each valve under the most adverse operating conditions. In addition, valves and their operators shall be satisfactory for application involving valve operation after long periods of inactivity. Valve operation shall be through a precision made, high quality, totally enclosed; factory greased and sealed worn gear reducer. Primary gearing shall consist of self-locking worm gear constructed of high tensile bronze and a worm polished or travelling nut designed according to AWWA specification C-504-74, Section 11.3. The valve operator shall be so sized that a maximum input force will be necessary to develop the required operating torque. When additional gearing is required to reduce the input force to the operator, it shall consist of a combination of helical or spur gearing in the first or input stage with a self-locking worm gear unit as described above in the final or output stage. The gearing of the valve operating mechanism shall be such that the operating nut shall turn clockwise to open the valve left. All gear operators shall be designed to transmit twice the required torque without permanent damage to the gear teeth. The valve shaft at the connection to the operator shall have built-in adjustable mechanical stops to prevent over-travel of the disc. These stops shall be fully enclosed and integral with the worm gear housing. Each operator shall be equipped with a large mechanical position indicator that is positively coupled to the valve shaft. The manual operators shall contain a 2 inch square operating nut.
9. Operators shall be watertight for buried service with extension shafts in enclosed, sealed housing and valve boxes at grade.
10. Butterfly valves shall be manufactured by DeZurik BAW, Sartell, MN or approved equal.

D. Solid Sleeve and "Dresser" Couplings

1. Solid Sleeve and "Dresser" couplings shall be mechanical joint with ductile iron glands or approved adapter gland.
2. Ductile iron Solid Sleeve and "Dresser" couplings shall conform to AWWA Specification C-110. Solid sleeves, plugs and caps shall also be ductile iron and conform to AWWA Specification C-110.
3. Coupling and bolts shall receive two coats of bituminous paint - Inertol No. 66 Special Heavy - after installation.

E. Insertion Valve

1. Insertion valves shall be first quality, free from all imperfections and defects. The sleeve shall be made of ASTM A-36 steel, epoxy coated to 10-12 mils. Valves shall open left.
 2. Insertion valves shall be QuikValve as manufactured by Romac Industries of Seattle, Washington or approved equal.

F. Tapping Sleeves and Valves

1. Tapping sleeves shall be extra heavy pattern designed to withstand the strains of making wet tap connections and they shall be of sizes suitable for use on the pipe on which the respective sleeves shall be installed and for use with the tapping valves. Cast iron or ductile iron tapping sleeves shall be municipal standard as manufactured by: Mueller Company, Inc., Union-Tyler Division, McWane, Inc., U.S. Pipe Co., or Equal.
2. Tapping sleeves shall be of the mechanical joint type, designed for a working water pressure of 200 psi and shall be of the same manufacturer as the tapping valve with which they shall be used. Tapping sleeves incorporating a compression "O" -ring seal around the tapped opening are not acceptable.
3. Mechanical joint nuts and bolts shall be in accordance with ANSI / AWWA Designation C 111 / A21.11. Inside and outside of all tapping sleeves shall be coated in accordance with Section 4-3 of ANSI / AWWA Designation C153/A21.55.
4. Tapping valves shall be furnished with flanged ends on the upstream side which shall register with the flange of the tapping sleeve. Downstream ends shall be furnished with tapping flanges for attaching the drilling machine, and also with bell ends for connection to the branch water main using mechanical joints.
5. Valves shall be provided with full-face rubber gaskets and square shank tee head bolts.
6. Except for as modified herein, tapping valves shall be as specified in Paragraph 2.03 of this Section.

G. Water Services

1. Piping for buried water services shall be Cross-linked Polyethylene (PEX) tubing and fittings as described in ASTM F876-99, NSF 14/61, and as outlined in 248 CMR 10.00: Uniform State Plumbing Code. Tubing size shall match existing service size unless otherwise indicated.
2. Fittings for service pipe shall be of the cast bronze, compression, flared tube type or pack type.

H. Corporation Stops

1. Corporation stops shall be CL200, bronze, lead free and ball type in accordance with AWWA Designation e800 and shall be manufactured in North America. They shall municipal standard as manufactured be: Cambridge Brass Ltd., Ford Meter Box Co, Inc., A.Y. McDonald Mfg. Co., Inc., or Mueller Co., Inc.
2. The inlet shall have a standard A WW A corporation valve inlet thread; and the outlet shall have a compression connection for plastic tubing. Corporation stops (one inch only) may be used with a flared outlet connection when approved by the Owner.
3. All corporation stops shall open to the right.
4. All corporation stops shall be by the same manufacturer.

I. Curb Stops

1. Curb stops shall be CL200, bronze, lead free, ball type in accordance with A WW A Designation C800 and shall be manufactured in North America. They shall be municipal standard as manufactured by: Cambridge Brass Ltd., Ford Meter Box Co., Inc., A.Y. McDonald Mfg. Co., Inc., or Mueller Co., Inc.
2. Each curb stop shall be equipped with a drain. Both ends of the curb stops shall have a compression connection for plastic tubing. Compression type connections may be substituted with flared connections when approved by the Owner.
3. All curb stops shall open to the right.
4. All curb stops shall be by the same manufacturer.

J. Curb Box

1. Each curb box shall be "Buffalo Style" iron-body with close fittings, have a dirt tight cover and be manufactured in North America. The top of the cover shall be flush with the top of the box rim with the word "WATER" clearly marked. The curb box shall be the slide type with a 2-1/2, inch shaft and include internal extension rods connected to the curb stop by cotter pin

K. Hydrants

1. Hydrants shall be in accordance with AWWA Designation C502. They shall be boltless at the bonnet and shoe. For purposes of municipal standardization, the following hydrants are acceptable to the Owner: Kennedy Company or equal.
2. Hydrants shall be of the post type dry barrel type and open right with a 5-1/4-inch valve opening. In addition, they shall come with one (1) 4-1/2 inch pumper

and two (2) 2-1/2 inch hose connections with National Standard Thread manufactured in North America.

3. The hydrant main valve shall be designed to remain closed in the event of a break in the hydrant above or near grade level.
4. Crushed stone for use as drainage material for hydrant assemblies shall conform to the requirements of Part 2.07 of Section 02224, "Materials."
5. A hydrant assembly shall consist of a hydrant anchoring tee of the appropriate size, a thrust block, a gate valve with a valve box, a hydrant and generally one full length of pipe. All joints shall be mechanical with retainer glands.
6. Where a hydrant assembly is to be disconnected from the existing main and reconnected to the new main, the Contractor shall cut the existing pipe at a sufficient distance from the hydrant to allow for the connection of the new pipe to the existing using a flexible coupling. The flexible coupling shall be municipal standard as manufactured by: Dresser, Inc., Rockwell, Inc., or Smith-Blair, Inc.
7. The barrel and spindle of all hydrants shall be painted yellow, the bonnet shall be painted green and the nozzle caps shall be painted green in accordance with the Owner's standards.

L. Gate Valves

1. Gate valves shall be in accordance with AWWA Designations C111, C509 and C550. They shall be municipal standard as manufactured by: American AVK Co., Inc., American Cast Iron Pipe Co., American Flow Control Division, Mueller Co., Inc., or U.S. Pipe and Foundry, Inc., Valve and Hydrant Division. All gate valves shall be by the same manufacturer.
2. Resilient-seated gate valves shall incorporate the following features:

Type of valve ends: mechanical joint with retainer glands,
Type of gate: resilient seat,
Type of stem seal: double O-rings,
Type of mounting: iron body, bronze mounted,
Type of stem: bronze, non-rising,
Type of gaskets: mechanical joint gasket,
Minimum rated working pressure: 250 psi,
Direction of operating nut opening rotation: open-right, and

As a minimum, the inside of the valve body and bonnet shall to be coated with
a
fusion bonded epoxy in accordance with ANSI / AWWA Designation C550.
3. Wrench nuts shall be two (2) inches x two (2) inches in accordance with Section 19 of AWWA Designation C509.

M. Valve Boxes

1. Valve boxes shall be 5-1/4-inch buffalo type, cast iron, two- (2-) piece, telescoping type, with a flange located approximately two (2) inches from the top of the valve box, suitable for the size valve on which they are used.
2. Covers shall be cast iron, marked "WATER", with two notched openings.

3. Valve boxes and covers shall be by the same manufacturer and shall be manufactured in North America only.
4. Valve boxes shall be centered over the operating nut of the valve and set to be flush at final pavement or finished grade.
5. Valve boxes shall be of good quality cast iron free from all defects in material and workmanship and shall be coated with coal-tar pitch enamel or other approved coating.

PART 3 EXECUTION

41.4 INSPECTION

- A. All pipe, fittings, couplings, valves, hydrants and accessories shall be carefully inspected by the Contractor for defects before installation, and all defective, unsound or damaged materials shall be rejected. The Owner shall make such additional inspections it deems necessary, and the Contractor shall furnish all necessary assistance for such inspections.
- B. No pipe joints shall be covered in any way until the joints have been inspected.
- C. Operating parts shall be operated several times to demonstrate proper operation and adjustment.

41.5 PREPARATION

- A. Proper implements, tools and facilities satisfactory to the Owner shall be provided by the Contractor for the proper and satisfactory execution of the Work.
- B. The interior of pipe, fittings, couplings, valves and hydrants shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations.
- C. The trench bottom and bedding shall be shaped and compacted to give substantially uniform unyielding circumferential support to the lower quarter of pipe and valves along their entire length. Bell holes shall be excavated so that, after placement, only the barrel of the pipe receives bearing pressure from the trench bottom and bedding.
- D. Pipe, pipe fittings, couplings, valves, hydrants and accessories shall be handled, stored, installed, jointed and protected by the Contractor in strict accordance with the written recommendations of the manufacturer of the materials.

41.6 INSTALLATION

A. General

1. All methods of installation shall be in accordance with the requirements of the Owner.
2. Reference is made to Section 02220, "Earthwork" and Section 02224, "Fill and Backfill Materials", for trenching and backfilling.
3. The Contractor shall furnish to the Engineer for its use, copies of the printed recommendations of the various manufacturers for the handling, storing, protection and installation of pipe, fittings, couplings, valves, hydrants and tapping sleeves.

4. Pipe, fittings, couplings, valves, hydrants, specials and accessories shall be installed in accordance with AWWA Designation C600 and the additional requirements specified herein, as indicated on the Contract Drawings and as directed by the Owner.
5. All bolts and nuts shall be heavily coated with two coats of bituminous paint comparable to Interol No. 66 Special Heavy.
6. All materials found to be defective during the process of the Work shall be rejected by the Owner, and the Contractor shall promptly remove such defective material from the job site. All defective material shall be replaced by the Contractor with new sound material at no additional expense to the Owner. The Contractor shall be responsible for the safe storage of all materials.
7. The Contractor shall furnish and install a vivid-color coded and continuous six- (6-) inch wide and four- (4-) mil thick, non-adhesive polyethylene warning tape approximately 24 inches above the crown of the new pipes. The tape shall be blue in color and shall have the words "CAUTION, BURIED WATER LINE BELOW" which shall be continuously repeated along the tape. When installed, the words shall be facing upwards.

B. Pipe, Fittings, Couplings and Accessories

1. The top of the water pipe shall be five (5) feet minimum below grade, except as otherwise noted or detailed on the Contract Drawings. The Contractor shall install the piping free of sags.
2. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets in the grade line. No spalls, shims or lumps shall be used to raise the pipe to grade. All pipe shall be maintained accurately to the required line and grade. Any pipe that has the grade or joint disturbed after laying shall be re-laid as directed by the Engineer.
3. Trenches shall be kept free from water so as to prevent flotation of the pipes. Pipelines shall be constructed in dry trenches and shall not be laid when the condition of the trench or the weather is unsuitable for such Work. An adjustable, watertight, removable plug shall be provided and placed into the open end of the newly laid pipe when pipe is not being placed. At times when the Work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substance shall enter the pipe or fittings. Pipes shall not be used as conductors for trench drainage during construction.
4. Jointing of mechanical joint specials, fittings, couplings, valves and hydrants shall be provided in accordance with the printed recommendations of the pipe manufacturer and as specified. The mechanical joint fittings, couplings, specials and valves shall be suitable for jointing with the pipe with which they are used, and the Contractor shall furnish and install, at no additional expense to the Owner, all necessary adapters for the proper jointing of pipe, pipe fittings, couplings, specials and valves. The last eight (8) inches of the outside of the spigot end of pipe and the inside of the bell of the mechanical joint shall be thoroughly cleaned to remove all oil, grit and other foreign matter from the joint. When assembling joint, the gland shall be brought into place and bolts tightened in a manner to insure the maintaining of the same space between the gland and the face of the flange at all points around the socket. The range of

bolt torque in making up joints shall be as recommended by the manufacturer of the mechanical joints. All mechanical joints shall be assembled with retainer glands.

Overstressing of bolts shall not be permitted. If effective sealing is not obtained at the recommended maximum bolt torque, the joint shall be disassembled, thoroughly cleaned and reassembled. Bolts shall be checked in the presence of the Engineer with a torque wrench approved by the Owner.

5. All fittings shall be anchored to prevent any movement of the fittings or the adjacent pipe. This anchorage shall be provided by the installation of Portland cement concrete thrust blocks and retainer glands as shown on the Contract Drawings and where and as directed by the Engineer. The Contractor shall verify the extent of anchorages required by the Engineer prior to piping assembly. Hand excavation may be required to excavate for the concrete thrust blocks, the shape and size of which shall be in accordance with the Contract Drawings. The Engineer may require concrete to be placed at points on the pipeline other than at fittings. All concrete used for thrust restraint shall be exposed for at least 16 hours before being covered.
6. Water mains shall be tapped in accordance with the manufacturer's latest published recommendations, i.e., depth of tap, number of threads exposed, allowable sizes, etc., and the Contractor shall adhere strictly to these recommendations. The Contractor shall be held responsible for all subsequent leaks or failure of the taps for one year from the date of final acceptance of the project and he shall make all necessary repairs that may be required during this period.
7. The Contractor shall install plastic tube and fittings in accordance with the details as shown on the Contract Drawings and the means and methods as described herein
8. Corporation and curb stops shall be installed in accordance with the Manufacturer's written instructions and the Owner's requirements.
9. Existing water mains to be abandoned shall be abandoned per Section 02648, "Abandonment of Existing Water Mains".

C. Wet Tap Connection to Existing Water Main

1. The work of installing tapping sleeves and valves and for making the wet taps under full main pressure shall be done only by workmen who are thoroughly experienced in this type of work.
2. The Contractor shall furnish the necessary services of factory-trained personnel and special factory equipment for making wet tap connections, at no additional expense to the Owner.
3. Existing water mains where wet tap connections are made shall be kept in service at all times.
4. Machine sleeves shall be installed in such a manner as to bring the tapping connections exactly at right angles to the centerline of the pipe to be tapped.
5. The wet tap connections shall be made in accordance with additional requirements of the Manufacturer of the tapping sleeves and valves.

6. Pipe upon which a tapping sleeve is to be installed shall be thoroughly cleaned of all foreign matter with scraping tools and wire brushed, a minimum of six (6) inches each side of the sleeve. Sleeve bolts shall be alternately tightened from the extreme end on one side to the extreme of the opposite side with approved torque wrenches until all are securely tightened. Take care to ensure that the tapping machine is kept in leveled horizontal position and securely supported so as not to transmit any additional weight to the tapping valve.
7. Valves and valve boxes shall be installed as per Part 3.01.E of this Section.

D. Water Service Connections

1. Connect all services to the new main as directed by the Owner, the Engineer and as specified herein. Services shall be connected after the new main has been tested, chlorinated and approved for service and the work shall result in a minimum disruption of service to the consumer.
2. Make only "wet taps" into the new mains and install corporation cocks, PEX tubing, new curb stops, new service boxes, fittings, etc., and make all joints water tight.
3. Services shall be installed to the limits as shown on the contract drawings or as directed by the Engineer. The Contractor shall connect the new PEX tubing to the existing service pipe using an approved coupling approximately 12 inches from the new curb stop on the building side of the stop.
4. Where transfers are being made and the existing service is lead or iron, the service shall be replaced to the limit of the Town's right of way.
5. All services shall be installed with 5 feet cover unless otherwise directed by the Engineer.
6. Where existing curb boxes are to remain and found to be below grade, the Contractor shall raise the upper section to grade. If the upper section cannot be raised, the Contractor shall remove the existing cover, install the new extension on the existing upper section and install a new cover.
7. Valves and valve boxes shall be installed as per Part 3.01.E of this Section.

E. Valves

1. The valve installations shall not be made when trench or weather conditions are unsuitable for the Work. All excavations and valve structures shall be kept free of water during installation of the valves and jointing operations and for such additional lengths of time as may be required to insure the satisfactory installation of the valve assemblies and appurtenant Work.
2. The Contractor shall make the necessary excavations, as directed, to uncover existing utilities for the purpose of determining, by the Engineer, the exact locations of all connections of the new Work to the existing water system. Connections of the new Work to the existing system shall be provided in accordance with the printed recommendations of the respective manufacturer and as approved by the Engineer.
3. Before installation, the Contractor shall carefully inspect the materials for defects, and no materials shall be installed which are known to be defective in any way. All new valves shall be fully opened and then closed to verify their

proper operation. All materials found to be defective before or after installation shall be rejected and shall be replaced by the Contractor with new, sound and approved material at no additional expense to the Owner. The Contractor shall be responsible for verifying in the field all lines, grades, dimensions and conditions and for the correct fittings of all parts prior to the order of materials and parts. Before jointing, all lumps, blisters and excess coating material shall be removed from the joint surfaces. All oil or grease shall be removed. The joint surfaces shall be wire-brushed and wiped clean and dry.

4. Valve boxes shall be provided for all valves and they shall be set plumb. Valve boxes shall be centered on the valve operating nuts so that they may be operated with a valve wrench. Care shall be taken that no part of a riser section and its pad shall bear on any part of the valve. Provision shall be made to keep any stones, mud or debris from entering the riser section during and after backfilling. Any blockage of the box shall be remedied by the Contractor at its own expense. Valves and riser sections shall be flush with the finished surface of the pavement. The bottom of the cover shall have a minimum clearance of three (3) inches from the top of the riser pipe.
5. Valves shall be set on a firm foundation, supported and anchored as shown on the Drawings. Selected excavated material shall be placed and tamped under and at the sides of the valve. Valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade.
6. Pipe bedding or backfill shall be carefully tamped under and around the valve box riser section and pad, and compaction shall extend to a distance of at least four (4) feet in locations of continuous trenching, elsewhere to the undisturbed trench face in each direction. The valve boxes each shall bear on a concrete or masonry pad.
7. Jointing of mechanical joint valves and accessories shall be provided in accordance with the printed recommendations of the Manufacturer as specified. The mechanical joint valves shall be suitable for jointing with the pipe with which they are used, and the Contractor shall provide, at no additional expense to the Owner, all necessary adapters for the proper jointing of the pipe, flexible couplings, pipe fittings, specials and valves.

F. Installation of Hydrants

1. The hydrant shall be installed where shown on the Contract Drawings and as directed by the Engineer. The hydrant shall be set plumb and with the ground line on the hydrant set at the designated ground elevation. The bottom of the hydrant shall be placed on a flat piece of rock or bricks which in turn shall be laid on firm undisturbed soil during excavation.

This backing shall be opposite the inlet and shall not obstruct the drip. No less than one (1) cubic yard of crushed stone shall be placed around the base of the hydrant before backfilling. In cases where groundwater is above the hydrant drip, the hydrant drip shall be plugged so that water does not seep into the hydrant. All plugged hydrant drips must be so indicated on the "as-built" plans. The Owner's fire chief shall be notified, in writing, to assure the hydrant shall be pumped out when used. The excavation shall then be backfilled with the material thoroughly rammed and tamped so that there can be no movement of the hydrant. The Engineer shall inspect the hydrant before installation to be sure that it is in good operating condition. After installation, the hydrant shall be flushed as directed by the Engineer. The Work of installing hydrant assemblies

includes the removal and disposal of existing hydrant assemblies as shown on the Contract Drawings and as directed herein.

2. The Work of installing hydrant assemblies includes the removal and disposal of existing hydrant assemblies as shown on the Contract Drawings and as directed herein.

G. Removal and Relocation of Hydrant Assembly

1. Five (5) days prior to removing an existing hydrant assembly from service, the Contractor shall notify the Owner and the Owner's fire chief of its intention. The Owner and the Owner's fire chief may direct the Contractor to modify its schedule for service removal, and the Contractor shall comply.
2. The hydrant assembly shall be removed and relocated either as shown on the Contract Drawings or as directed by the Owner. Disconnecting the hydrant assembly, storing it and relocating it shall consist of removing and disposing of the assembly from the existing main to a sufficient distance from the hydrant to allow for the joining of the new pipe to the existing. The Contractor shall cut the existing pipe at a sufficient distance from the hydrant to allow for the joining of new pipe to the existing with a flexible connection. The Contractor shall make the connection.
3. Hydrants to be relocated shall be installed as per Part 3.01.F of this Section.
4. Hydrants to be abandoned shall be abandoned per Section 02648, "Abandonment of Existing Water Mains".

END OF SECTION

SECTION 33.11.13

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

- 15.1 SCOPE OF WORK
- 15.2 RELATED WORK SPECIFIED ELSEWHERE
- 15.3 SUBMITTALS

PART 2 MATERIALS

- 15.4 DUCTILE IRON PIPE AND FITTINGS
- 15.5 PUSH-ON JOINTS
- 15.6 MECHANICAL JOINTS
- 15.7 FLANGED JOINTS
- 15.8 PIPE MARKING

PART 3 EXECUTION OF WORK

- 15.9 HANDLING AND CUTTING PIPE
- 15.10 INSTALLING PUSH-ON JOINT PIPE AND FITTINGS
- 15.11 DEFLECTION OF PIPE
- 15.12 INSTALLING MECHANICAL JOINT PIPE AND FITTINGS
- 15.13 CONNECTION TO EXISTING WATERMAINS
- 15.14 REMOVAL / ABANDONMENT OF EXISTING WATER MAINS

PART 1 GENERAL

- 15.1 SCOPE OF WORK
 - A. The Contractor shall furnish, install and test ductile iron pipe and fittings and appurtenant materials as shown on the Contract Drawings and specified herein.
- 15.2 RELATED WORK SPECIFIED ELSEWHERE
 - A. ALL DIVISIONS - As Appropriate
- 15.3 SUBMITTALS
 - A. Submit to the Engineer six (6) sets of shop drawings detailing the type and class of materials to be furnished. The Contractor shall not purchase the pipe prior to the Engineer's approval of the shop drawings.

PART 2 MATERIALS

- 15.4 DUCTILE IRON PIPE & FITTINGS
 - A. The Ductile Iron pipe shall be designed in accordance with AWWA C150 and shall be manufactured in accordance with AWWA C151. The Ductile Iron pipe shall conform to the ANSI A21.50, A21.51 Specifications for Ductile Iron Pipe. The grade of iron, from which pipe is made, shall be 60-42-10, having 60,000 psi minimum tensile strength, 42,000 psi minimum tensile strength, 42,000 psi minimum yield strength, and 10% minimum elongation.

PIPE SIZE	Thickness (inches)	Thickness Class	Rated Working Pressure
6"	0.31	52	350
8"	0.33	52	350
10"	0.35	52	350
12"	0.37	52	350
16"	0.34	50	350
16"	0.40	52	350

- B. Pipe fittings shall conform in all respects to ANSI 21.10 and 21.11 (AWWA C110 and C111) and shall be mechanical joint. Compact fittings 3 inches through 16 inches shall conform to ANSI/AWWA C153/A21.53 and shall be mechanical joint. Compact fittings larger than 16 inches shall not be used. All fittings shall be restrained with restrainer glands (Megalug or equal).
- C. Pipe shall be of the push-on type, unless specified, mechanical joint or flanged as shown on the Contract Drawings.
- D. All pipe and fittings shall be supplied with silicon bronze serrated wedges.
- E. All pipe and fittings shall be furnished with a cement lining on the inside of the pipe. The lining shall be twice the thickness as specified in ANSI A21.4 (AWWA C104). Cement lining shall be double thickness. The cement lining shall be given a seal coat of asphalt material. Asphalt seal coat shall not impart taste or odor, or toxic or carcinogenic compounds to the water contained therein. Asphalt seal coat shall be a product acceptable to the U.S. E.P.A. for use in potable water and shall be so listed in the most current E.P.A. summary of approved products. The asphalt seal coat shall be applied and cured in strict conformance with the coating manufacturer's cautions and instructions. The seal coat shall be applied by the pipe manufacturer or supplier, under controlled factory conditions and field application is strictly prohibited.
- F. All ductile iron pipe for buried service shall be furnished with a minimum of 1 mil thick bituminous coating on the outside of the pipe.
- G. Fittings shall be ductile iron, with mechanical joint ends unless otherwise noted. All fittings shall be cement lined and coated inside and out, as specified hereinbefore for ductile iron pipe. Branch of tees for hydrants or stubs shall be mechanical joint anchoring tees.
- H. All fittings shall be Class 350 and all fittings shall conform with the weights and dimensions shown in the latest edition of the CIPRA Handbook of Ductile Iron Pipe and Cast Iron Pipe.
- I. Where required, flanged fittings shall be furnished and installed. Fittings shall be ductile iron as specified or as shown, and shall have Class 125 drilled flanges and shall conform in every respect to the applicable requirements of AWWA C115 and ANSI B16.1.
- J. Retainer glands with double heat treated set screws shall be furnished as required or as shown on the contract drawings for all fittings, caps and plugs subject to movement by line surge or internal pipe stresses.

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- K. Joint accessories shall consist of high strength ductile iron glands, rubber gaskets, tee head or hex head bolts and nuts. Nuts and bolts shall be made of low alloy steel or stainless steel as required, where corrosive soils and/or saltwater conditions exist. Bolts and set screws shall be torqued in accordance with the manufacturers recommendations.

15.5 PUSH-ON JOINTS

- A. Push-on joints shall meet all the requirements of ANSI A21.11 and shall consist of a single continuous, molded, rubber ring gasket; a bell socket cast integrally with the pipe or fitting; and a plain end. The configuration shall be such that when the plain end is inserted into the pipe fitting socket, the gasket shall be compressed radially to form a positive seal. The gasket and annular space shall be so designed and shaped that the gasket is locked in place after the plain end is inserted into the fitting socket.
- B. Push-on joints shall have the same pressure rating as the pipe or fitting of which they are a part.
- C. Gaskets for push-on joints shall be vulcanized natural or synthetic rubber. All gaskets shall be free of porous areas, foreign material and visible defects.

15.6 MECHANICAL JOINTS

- A. Mechanical joints shall meet all the requirements of ANSI A21.11 and consist of: a bell socket cast integrally with the pipe or fitting and provided with an exterior flange having bolt holes and a socket with annular recess; a plain end; a continuous molded, rubber ring gasket and; a follower with bolt holes, tee head bolts and hexagonal nuts.
- B. Mechanical joints shall have the same pressure rating as the pipe or fitting of which they are a part.
- C. Glands for mechanical joints shall be cast or ductile iron and be stamped with the manufacturer's identification, nominal size and material type. Glands shall receive a bituminous coating at the shop.
- D. Rubber gaskets for mechanical joints shall be natural or synthetic vulcanized rubber, free of porous areas, foreign materials and visible defects.

15.7 FLANGED JOINTS

- A. Flanged joints shall meet all the requirements of ANSI A21.15 and ANSI A21.10 and shall consist of two threaded flanges; flange gasket and; bolts with square or hexagonal shaped heads and hexagonal nuts.
- B. Threaded flanges shall be individually fitted and machine tightened on the threaded pipe by manufacturer. Threaded flanges shall not be installed in the field. Flange faces shall be machined.
- C. Pipe furnished with flanges at each end shall have the bolt holes aligned.
- D. Flange gaskets shall be ring or full face rubber and be 1/8 inch thick.

15.8 PIPE MARKING

SECTION 33.11.13 3

- A. The weight, class or nominal thickness and casting period shall be shown on each piece of pipe. The manufacturer's mark, year of fabrication and the letters "DI" or the word "Ductile" shall be cast or stamped on in letters and numerals not less than ½ inch in height.

PART 3 EXECUTION OF WORK

15.9 HANDLING AND CUTTING PIPE

- A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe or lining, scratching or marring machined surfaces and abrasion of the pipe coating or lining.
- B. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.

15.10 INSTALLING PUSH-ON JOINT PIPE AND FITTINGS

- A. Prior to assembling, the bell and plain end shall be cleaned of all foreign matter. Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant, supplied by the pipe manufacturer, uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe. The end of the plain pipe shall be chamfered to facilitate assembly. The end shall be inserted into the gasket and then forced passed it until it seats against the bottom of the socket. Bedding and backfill requirements shall be as shown on the Contract drawings.

15.11 DEFLECTION OF PIPE

- A. When laying ductile iron pipe, the deflection at the joints shall not exceed 5 degrees or 12 inches for a 16 foot length of pipe.

15.12 INSTALLING MECHANICAL JOINT PIPE AND FITTINGS

- A. Prior to assembling mechanical joints the bell and plain end shall be cleaned of all foreign matter and then brushed with non-toxic gasket lubricant supplied by the pipe manufacturer. With the follower gland and gasket on the plain end, seat the plain end into the bell and press the gasket evenly and firmly into the bell. Move the follower gland into position for bolting and insert all nuts and bolts and make finger tight. The follower gland shall be tightened evenly using a torque wrench on opposite bolts until all are made up. Bedding and backfill requirements shall be as shown on the Contract drawings. All nuts and bolts shall be given a bituminous coating after bolts are tightened. All fittings shall be rodded to the other fittings or a restraining gland placed on the pipe.

15.13 CONNECTIONS TO EXISTING WATER MAINS

- A. At least eight (8) hours prior to connecting to any existing water main, the Contractor

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shall notify the Water Department. At no time shall the Contractor operate any existing system valve or hydrant. All such operations shall be performed by Water Department Personnel. Prior to connecting or disconnecting any fire sprinkler service line, the Contractor shall notify the Fire Department, Water Department and a responsible party at the building(s) being serviced by the line.

- B. Make all cuts into the various water pipes, and install the required sleeves, tees, couplings, adaptors, reducers, pipe nipples, jointing materials, and other fittings which may be required and make all joint watertight, as shown on the drawings or as specified herein, and do whatever work is shown or intended to be done in order to make complete and effective connections to existing water mains.
- C. The cutting, removal, plugging, and bracing of parts of the existing water mains made necessary by this work, and the shutdown of the existing water system and subsequent pumping, hand excavating and whatever time that may be required by the Owner to notify customers of discontinuation of water service, time required to effect tight closures of existing valves, and any reasonable changes that may be required by the Engineer, or any other work done hereunder shall be considered as an obligation of the Contractor to complete the work. No additional compensation will be made for such work, other than that directly covered by the applicable bid items listed in the proposal.
- D. The work shall be coordinated with the Owner and such connections that may be required shall be made at such times and in such a manner as to cause as little interference in water service within the existing system as practicable.

15.14 REMOVAL / ABANDONMENT OF EXISTING WATER MAINS

- A. All existing water mains and appurtenances to be replaced shall be physically removed and disposed of by the Contractor unless otherwise directed by the Engineer.
- B. Sections of existing water main that are permitted to be abandoned in-place by the Engineer shall have open ends plugged with concrete or brick and mortar to prevent the entrance of soil into the pipe after backfilling.

END OF SECTION

SECTION 33.31.16

SERVICE LATERALS

<u>PART 1</u>	<u>GENERAL</u>
16.1	CONTRACT DOCUMENTS
16.2	DESCRIPTION OF WORK
16.3	RELATED WORK SPECIFIED ELSEWHERE

<u>PART 2</u>	<u>MATERIALS</u>
16.4	MATERIALS

<u>PART 3</u>	<u>EXECUTION OF WORK</u>
16.5	HANDLING AND LAYING
16.6	DROP SERVICE CONNECTIONS

PART 1 GENERAL

16.1 CONTRACT DOCUMENTS

- A. The General Provisions of the Contract including General and Supplemental Conditions and Requirements apply to the work specified in this section.

16.2 DESCRIPTION OF WORK

- A. The Contractor shall furnish, lay, join, test and mark all service laterals as specified herein and/or as directed by the Engineer. The Contractor is reminded that the provisions of this Section are supplemental to those in the Section on Gravity Sewer Piping.

16.3 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 01300—SUBMITTALS
- B. DIVISION 2—SITE WORK—As Appropriate
- C. DIVISION 3—CONCRETE--As Appropriate

PART 2 MATERIALS

16.4 MATERIALS

- A. Service lateral piping and fittings in size 6 inch, shall correspond in materials and construction to the material furnished for gravity sewers 8 inches and larger and shall be manufactured to the requirements of the appropriate gravity sewer specification.
- B. Service lateral piping shall be 6" inside diameter and in laying lengths not to exceed 6 feet, 6 inches.
- C. Drop connection piping shall be of the same material as the service connection, unless otherwise directed by the Engineer.

PART 3 **EXECUTION OF WORK**

16.5 **HANDLING AND LAYING**

- A. The Contractor shall make connections to the sewer by means of previously installed wye or tee fittings as specified in the section on Gravity Sewer Piping. The lateral pipe shall be run on a grade of at least ¼ inch per foot to the property line or as directed by the Engineer.

- B. The lateral pipe shall be properly capped with a watertight fitting for future connection to the house sewer. All laterals shall be physically marked by the Contractor as to the location of the end of the lateral. The physical marker shall be 2" x 2" wooden board extending vertically from a point one foot above the invert of the lateral pipe, to a point one foot above finished ground elevation. This marker shall be verified as to its location before any backfilling of the lateral pipe trench is done. After the marker is secured in place by backfilling the trench, the one foot projection shall be sprayed with white or yellow paint.

- C. If service connections cannot be located or the Contractor damages them, the Contractor shall provide a connection as specified under Connection to Existing Facilities, at no additional cost to the Owner.

- D. If a new lateral is to be constructed where there is no previously installed connection and it is determined by the Engineer not to be the fault of the Contractor, the Contractor shall provide a connection as specified under section on Connections to Existing Facilities, at the cost of the Owner.

16.6 **DROP SERVICE CONNECTIONS**

- A. When the vertical drop into the sewer is greater than 4 feet or when directed by the Engineer, the Contractor shall construct drop connections as shown on the Detail Sheet. All pipe shall conform to specifications and have a standard joint between each pipe. Care shall be taken to have all joints correctly made and the alignment correct.

- B. Connections shall be done in one continual operation including the concrete backing above the wye branch.

END OF SECTION

SECTION 33.33.00

GRAVITY SEWER AND FORCE MAIN PIPE - GENERAL

- 33.1 SCOPE OF WORK
 - 33.2 RELATED WORK SPECIFIED ELSEWHERE
 - 33.3 PIPE AND FITTINGS
 - 33.4 GENERAL
 - 33.5 LINES AND GRADES
 - 33.6 PIPE FOUNDATION
 - 33.7 NORMAL SOIL CONDITIONS
 - 33.8 UNSTABLE SOIL CONDITIONS
 - 33.9 CONCRETE ENCASEMENT
 - 33.10 INSPECTION OF PIPE BEFORE INSTALLATION
 - 33.11 INSTALLATION OF PIPE AND FITTINGS
 - 33.12 FINAL INSPECTION
 - 33.13 FINAL TESTING
 - 33.14 AIR TEST
 - 33.15 MANDRILL TEST
 - 33.16 TEMPORARY PLUGS
 - 33.17 CONNECTION TO EXISTING STRUCTURES
-
- 33.1 SCOPE OF WORK
 - A. The Contractor shall furnish, lay, join and test all gravity sewer and force main pipe, and appurtenant materials and equipment as indicated on the drawings and as specified herein.
 - 33.2 RELATED WORK SPECIFIED ELSEWHERE
 - A. EARTHWORK – As Appropriate
 - 33.3 PIPE AND FITTINGS
 - A. Specifications for types and classes of pipe and fittings required are contained in related sections.
 - 33.4 GENERAL
 - A. The specifications in this section are applicable to the installation of gravity sewer and force main pipe.
 - 33.5 LINES AND GRADES
 - A. Pipes shall be laid to the lines and grades shown on the drawings or as directed by the Engineer. The grade shown on the profile is that of the invert of the pipe. The work shall conform to this grade. A variation of one-eighth (1/8) inch or more from the true invert grade on gravity sewers laid on grades above one percent will be deemed sufficient reason to cause the work to be rejected. Work so rejected shall be corrected by the Contractor at his own expense.
 - B. The Contractor is responsible for establishing the location of the pipe, manholes and other appurtenances, and bench marks along the route of the pipeline at convenient intervals for use during construction.

- C. The grade and alignment of the pipe may be maintained, with the approval of the Engineer, by the use of laser beams if the Contractor can demonstrate that he possesses sufficient equipment and employs with sufficient experience, to utilize such method.
- D. The Contractor shall furnish all labor, material, surveying equipment and tools to establish and maintain all lines and grades from basic control points furnished by the Engineer.

33.6 PIPE FOUNDATION

- A. All pipes to be laid in open trench excavation shall be bedded and uniformly supported over their full length on foundations of the types specified and shown on the drawings. Flat-bottomed trenches shall be excavated and dewatered prior to preparing the specified foundation. All work shall be performed in a dry trench. Where higher type foundations than those shown on the drawings are ordered as a result of the Contractor's method of operation, the Contractor shall be due no additional compensation. Where directed by the Engineer as a result of unsuitable soil conditions, the Contractor shall be paid for special bedding under appropriate bid items.

33.7 NORMAL SOIL CONDITIONS

- A. All pipe shall be supported on a normal soil condition foundation, except as otherwise indicated on the drawings, or ordered by the Engineer. The trench shall be excavated to a depth equal to $\frac{1}{4}$ of the outside diameter of the pipe to be installed (6" minimum) below the bottom of the pipe. Screened gravel bedding shall be furnished and placed in the trench for its full width to uniformly support the pipe at the required line and grade. Suitable recesses shall be provided in the bedding to permit adequate clearance for bells, couplings, or similar projections. The bedding shall extend upward around the pipe barrel. Bedding material shall be spread in 6 inch layers, and each layer shall be compacted with twenty pound hand tampers or pneumatic tampers until the required total depth of bedding has been built up.

33.8 NORMAL SOIL CONDITIONS

- A. Where unstable soil conditions are encountered, the pipe shall be supported on a special foundation. The foundation shall be installed where a suitable supporting soil or rock stratum occurs at a depth greater than $\frac{1}{4}$ of the outside diameter or 6" minimum. The trench shall be excavated to the depth necessary to reach the suitable supporting stratum (3'-0" minimum). The trench bottom and walls shall be covered with a geotextile fabric. Screened gravel shall then be furnished as bedding and placed in the trench for its full width. The bedding shall be spread in 12 inch layers, and each layer shall be compacted with twenty pound hand or pneumatic tampers. The bedding shall carry vertically from the supporting stratum up to an elevation $\frac{1}{4}$ of the outside diameter (12" minimum) above the top of the pipe. The special foundation shall extend for a minimum of 5'-0" beyond poor subgrade conditions.

33.9 CONCRETE ENCASUREMENT

- A. Where required, the pipe shall be supported on foundation. The foundation shall be installed where (a) excavations have been carried outside the normal limits as defined under related sections or (b) as directed by the Engineer. The trench shall be excavated to $\frac{1}{4}$ of the outside diameter (6 inch minimum and a 12 inch maximum depth) below the bottom of the pipe. The excavated space shall then be completely filled with concrete, and the entire pipe encased in concrete such that the minimum concrete encasement at any point around the outside barrel of the pipe measures 4 inches thick. The depth of encasement over the pipe shall be $\frac{1}{4}$ of the outside diameter (12" minimum). The total minimum width of the concrete encasement shall equal the width of trench excavation.

Unless otherwise shown on the drawings or specified herein, concrete shall be 3,000 psi. Concrete mix, formwork, curing, etc., shall be in accordance with the requirements of appropriate sections. Freshly poured concrete shall be maintained free from ground water for at least the first four hours. No backfilling of the trench shall begin until a minimum time period of 24 hours has elapsed after the encasement has been poured. Steel reinforcing, if required, shall be as shown on the drawings or as directed by the Engineer.

33.10 INSPECTION OF PIPE BEFORE INSTALLATION

- A. All pipes and fittings shall be carefully inspected in the field before placing the trench. Cracked, broken, warped, out-of-round or otherwise defective pipe, fittings as determined by the Contractor or Engineer, shall be pulled and not installed. Such rejected pipe shall be pulled and not installed. Such rejected pipe shall then be removed from the job site by the Contractor at his own expense.

33.11 INSTALLATION OF PIPE AND FITTINGS

- A. After the trench has been brought to the proper grade, as hereinbefore specified, the pipe shall be laid. Unless otherwise approved by the Engineer in writing, pipe laying shall be done only in the presence of the Engineer. The Contractor shall give ample notice of his schedule for pipe laying operations to the Engineer.
- B. All pipe and fittings shall be carefully lowered into the trench with ropes, slings and proper equipment. Pipe cracked or otherwise damaged during or following installation shall be marked by the Contractor or Engineer and removed from the site as required.
- C. Pipes shall be laid true to the grades shown on the drawings. Blocking will not be permitted except where the pipe is to be permitted except where the pipe is to be encased in concrete. Any pipe that has its grades or joints disturbed after laying shall be taken up and relaid. The interior and ends of all pipe shall be thoroughly cleaned during laying operations by means of plugs or other approved methods. Under no circumstances shall pipe be laid in water and no pipe shall be laid when trench conditions or the weather is unsuitable for such work except by permission of the Engineer.

33.12 FINAL INSPECTION

- A. Each section of installed sewer lines shall be visually inspected by the Engineer prior to final testing. The pipe shall be true to both line and grade, shall contain no broken pipe, shall show no leaks, shall show neither obstructions nor the projection of connecting pipes into the main pipe, and shall contain no debris or other deposits which will in any way reduce the full cross-section area of the pipe.
- B. Any section of sewer pipe which does not comply with these inspection criteria, as determined by the Engineer, shall be promptly corrected, replaced or repaired by the Contractor at his own expense. Methods used for the correction shall be approved by the Engineer.

33.13 FINAL TESTING

- A. The Contractor shall remove all debris from manholes and shall thoroughly flush sewers and force mains prior to testing for watertightness. All sewers and force mains, (not including manholes), service connections and sewer laterals constructed under this Contract shall be tested under this section and shall satisfactorily meet the test requirements prior to final acceptance of the work. The Contractor shall furnish all labor, testing materials and equipment (including plugs and standpipes) to perform tests.

- B. For the force main, the contractor shall perform a low pressure air test under the supervision and to the entire satisfaction of the Engineer.
- C. For gravity sewer, the contractor shall perform a low pressure air test as well as the mandrill test under the supervision and to the entire satisfaction of the Engineer.
- D. Subject to approval of the Engineer and provided that the tests are made within a reasonable time considering the progress of the project as a whole, the Contractor may backfill the pipe section to support it while testing. Pipelines in excavation greater than eight (8) feet or embedded in concrete shall be tested prior to the backfilling or placing of the concrete.
- E. The contractor shall furnish and install suitable temporary testing plugs or caps, all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment, as well as all labor required.

33.14 AIR TEST

- A. The contractor shall furnish all necessary equipment and labor and carry out at his own expense an air test.
- B. If low pressure air testing is performed on the gravity sewer, the pressure between two (2) consecutive manholes shall not drop more than point five (0.5) psi (from five (5.0) to four point five (4.5) psi in excess of the ground water pressure above the top of the sewer in less than seven point five (7.5) minutes. Consult with the Engineer for a determination of the ground water during construction, if applicable.
- C. For the force main, the air pressure between the pump chamber and the discharge point shall not drop more than point five (0.5) psi (from fifty (50) to forty-nine point five (49.5) psi in seven point five (7.5) minutes.
- D. The Owner and the Engineer shall be furnished with certified copies of the testing results. The Engineer shall be present for the tests.
- E. If the section fails to pass the test, the Contractor shall do everything necessary to locate, uncover, even to the extent of uncovering the entire section, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work.
- F. If, in the judgement of the Engineer, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure shall be made as required or approved, but in any event the Contractor shall be responsible for the ultimate tightness of the line.

33.15 MANDRILL TEST

- A. In addition to pressure testing of the lines, all gravity sewer lines shall be mandrilled to a five (5) percent tolerance of the nominal pipe diameter.
- B. Failure of any portion of the pipeline shall require replacement of the pipe section and retesting.

33.16 TEMPORARY PLUGS

- A. At all times when sewer and force main pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of earth or other materials entering the pipe has passed.

33.17 CONNECTION TO EXISTING STRUCTURES

- A. Piping to be connected to existing manholes where no stub or other opening has been provided shall be made through an opening of minimum diameter cut in the wall of the structure at the required elevation and location. All penetrations shall be made by core boring unless otherwise approved by the Engineer. The Contractor shall furnish and install a pipe stub.
- B. The annular space outside of the pipe stub shall be filled and sealed with non-shrinking grout. The outer surface of heavy bitumastic Water-proofing compound of a type approved by the Engineer.
- C. The benchwalls within the existing structure shall be altered as required to form a new flow channel from the new connection to the existing flow channel as shown on the Contract Drawings or directed by the Engineer. The new channel shall be constructed with a smooth and continuous radius as indicated and approved by the Engineer.

END OF SECTION 33.33.00

SECTION 33.90.00

MODIFICATION AND CONNECTIONS TO EXISTING STRUCTURES

90.1	SCOPE OF WORK
90.2	RELATED WORK SPECIFIED ELSEWHERE
90.3	GENERAL
90.4	CONCRETE
90.5	CEMENT CONCRETE BLOCKS
90.6	BRICK MASONRY
90.7	MORTOR
90.8	FRAMES, COVERS, GRATES AND MANHOLE STEPS
90.9	PRECAST SECTIONS
90.10	GENERAL
90.11	INTERFERENCE
90.12	MODIFICATION OF STRUCTURES
90.13	CLEANING, CARE, & RESTORATION
90.14	NORMAL JOINT CONNECTIONS
90.15	CONNECTION TO EXISTING STRUCTURES
90.16	CONNECTION TO EXISTING SEWERS
90.17	MANHOLES INTERCEPTING EXISTING SEWERS
90.18	LAYING BRICK AND BLOCKS
90.19	PLACING CASTINGS
90.20	DRAINAGE OR SEWERAGE STRUCTURES ABANDONED OR REMOVED

90.1 SCOPE OF WORK

- A. The Contractor shall make all connections to the existing facilities as indicated on the drawings and as herein specified, or as directed.
- B. The Contractor shall furnish all labor, equipment, materials, appurtenances and incidentals and perform all operations in connection with the satisfactory rehabilitation and modification of existing drainage and sewer structures.
- C. Work shall be performed at the locations shown on the Contract Drawings and where directed by the Engineer.
- D. Existing pipeline or structures damaged by the Contractor shall be replaced by him at his own expense in a manner approved by the Engineer.
- E. Work shall consist of removing, replacing and adjusting the masonry and castings of present structures, as required, to conform to newly proposed line and grade changes; to change in type of structure, or change in type of castings; all in accordance with these specifications and in close conformity with the lines and grades shown on the Drawings or established by the Engineer.

90.2 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 01.33.00 - SUBMITTALS
 - B. SECTION 33.05.13 - PRECAST CONCRETE STRUCTURES AND MANHOLES
 - C. SECTION 04.00.00 - MASONRY WORK
- 90.3 GENERAL

- A. Brick masonry and cement concrete block or bricks for drop inlets, special modified drop inlets, catch basins, manholes or other related structures, where permitted or required for repair or construction shall be good sound, hard and uniformly burned, regular and uniform in shape and size, of compacted texture and satisfactory to the Engineer.
- B. Bricks and blocks that are broken, cracked or of improper size or quality, or unduly chipped or otherwise defective shall not be used in the work and shall be immediately removed from the site and satisfactory bricks substituted therefore.
- C. Samples of brick and blocks to be used in the work shall be submitted to the Engineer for approval before shipment. Bricks used in the work shall conform to the approved samples.

90.4 CONCRETE

- A. All cast in place concrete shall conform to the requirements of SECTION 03.30.00 - CAST-IN-PLACE CONCRETE.

90.5 CEMENT CONCRETE BLOCKS

- A. Cement concrete blocks shall be machine made solid segments, conforming to the requirements for Concrete Masonry Units for Construction of Catch Basins and Manholes, ASTM-C139, supplemented by the following requirements:
 1. The blocks shall be 6 inches in width for basins and manholes of 9 feet or less in depth, 8 inches in width below a depth of 9 feet when used in structures having a depth greater than 9 feet.
 2. The permissible dimensional variation for nominal size shall be in accordance with ASTM-C139.
 3. For cylindrical structures, the inside and outside surfaces of the blocks shall be curved to the necessary radius and so designed that the interior surfaces of the structures shall be cylindrical, except the top batter courses which shall be designed to reduce uniformly the inside section of the structure to the required top size and shape.
 4. The blocks used in the top courses shall be designed to produce a surface 8 inches on width upon which to seat the frame and the curb inlet when one is used.
 5. Blocks shall be so designed that only full length units are required to lay any one Course.
 6. Blocks shall be sampled and tested in accordance with ASTM-C140. The minimum average compressive strength for 5 representative blocks shall be 3000 PSI. The minimum compressive strength for one individual block shall be 2500 PSI.

90.6 BRICK MASONRY

- A. Brick masonry shall conform to the requirements of SECTION 04.00.00 - MASONRY WORK.

90.7 MORTAR

- A. Mortar shall be composed of Portland cement, hydrated lime, and sand, materials shall conform to the requirements of SECTION 04.00.00 - MASONRY WORK.
- B. Hydrated lime shall be Type S conforming to the ASTM Standard Specification for Hydrated Lime for Masonry Purposes, Designation C207.

90.8 FRAMES, COVERS, GRATES, AND MANHOLE STEPS

- A. Frame covers and grates shall be all cast iron conforming to the Standard Details and Drawings. All shall be designed for highway loads.
- B. The castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined at the foundry, before shipment to prevent rocking of covers in any orientation. Allowances shall be made in the patterns so that the thicknesses specified or shown shall not be reduced in obtaining finished surfaces.
- C. All castings shall be thoroughly cleaned and subject to a careful hammer inspection.
- D. Castings shall be at least Class 30 conforming to the ASTM Standard Specification for Gray Iron Castings, Designation A48. Casting shall not be acceptable if the actual weight is less than 95 percent of the theoretical weight computed from the dimensions as shown. The Contractor shall provide facilities for weighing castings in the presence of the Engineer or shall furnish invoices to the Engineer showing true weights certified by the supplier.
- E. Before being shipped from the foundry, castings shall be sand-blasted and given two coats of coal-tar-pitch varnish, applied in a satisfactory manner so as to make a smooth coating, tough, tenacious, and not brittle or with any tendency to scale off.
- F. Manhole rungs, where designated by Contract Drawings or as specified shall be 14" wide stainless steel or high density polyethylene. The portion of the legs to be embedded in the precast section shall have fins and be tapered to insure a secure bond.
- G. Manhole rungs shall be cast in place in the precast riser and cone sections during the manufacture of the sections. Precast sections having rungs which are grouted, mortared or driven in place shall not be accepted.

90.9 PRECAST SECTIONS

- A. Precast concrete barrel sections, cones, and bases shall conform to ASTM C478 except as may be otherwise shown on the Standard Details.
- B. Sections shall be steam cured and shall not be shipped until at least five days after having been cast.
- C. No more than two lift holes may be cast in each section.
- D. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.
- E. The tops of the bases shall be suitably shaped, and connections shall be made with approved round rubber "O" - ring gaskets or flexible plastic gaskets.
- F. The round rubber "O" - ring gaskets shall conform to ASTM C443. The flexible plastic gasket shall conform to AASHTO M198. They shall be designed and manufactured so that the completed joint will withstand an internal hydrostatic pressure of excess of 13 psi for 10 minutes without showing any leakage by the gasket or displacement of it. The Contractor's supplier shall test the effectiveness of the joints against leakage. Such tests shall be made by an internal hydrostatic pressure against the joint of 13 PSI for 10 minutes. A complete set of records of the test shall be submitted to the Engineer.

90.10 GENERAL

- A. Before initiation of any reconstruction work which requires interrupting the flow in an existing sewer, combined sewer, or storm drain, the Contractor shall provide for temporary

flow of the sewage and/or drainage during the reconstruction operations. The procedure used to reroute the flow shall be subject to the approval of the Engineer, and the Contractor shall have suitable equipment on hand to perform all work as planned in a quick and efficient manner.

- B. When removing the existing structure, care shall be taken to remove only as much of the existing structure as is necessary to make the proper repairs.
- C. The Contractor shall have all possible preparatory work done and shall provide all labor, tools, material and equipment required to do the work in one continuous operation.
- D. The Contractor shall have no claim for additional compensation, by reason of delay or inconvenience, for adapting his operations to the needs of the public.

90.11 INTERFERENCE

- A. The Contractor shall develop a program for the construction and placing in service of the new works or the re-direction of existing works subject to any notes on the Contract Drawings and to the approval of the Engineer. All work involving cutting into and connecting to the existing facilities shall be planned so as to interfere with operation of the existing facilities for the shortest possible time and when the demands on the system best permit such interference even to the extent of working outside of normal working hours to meet these requirements.

90.12 MODIFICATION OF STRUCTURES

- A. When the line and/or grade of the structure requires a change of 6 inches or less, the structure shall be adjusted to line and grade. The masonry shall be removed to such depth as directed by the Engineer and new masonry shall be constructed to conform to the proposed design.
- B. When the line and/or grade of the structure requires a change greater than 6 inches the structure shall be remodeled. The sloped masonry and the vertical masonry shall be removed to such depths as directed by the Engineer.
- C. When the failing condition of a structure requires its modification, the masonry shall be removed to such depth as directed by the Engineer and new masonry shall be constructed to conform to the proposed design.
- D. When the change in type of structure is required, as converting a basin to a manhole, the masonry shall be removed to such a depth as directed by the Engineer and new masonry shall be constructed to conform to the proposed design.
- E. A 6-inch compacted subbase, consisting of Type 3 sand and gravel shall be placed under the concrete foundations of structures which require complete removal and reconstruction.

90.13 CLEANING, CARE, AND RESTORATION

- A. All materials shall be removed from the catch basin sump and immediately disposed. Silt, sand, debris and all other materials shall be removed to the bottom of the sump to the satisfaction of the Engineer. It will not be necessary to provide a wash-clean sump but hosing or cleaning of the brick faces where necessary to determine the condition of the structure may be required by the Engineer. Rodding and flushing of existing lines will be required to ensure fully functional drain systems. Cleaning by hand may be required. Repairs shall be made as required by the Engineer.
- B. The structure shall be considered to be clean when the material remaining in the structure shall not be more than 2-inches in depth, if leveled, and when the outlet pipe has been rodded and flushed with water to ensure that all materials have been removed from within.

In order to clean the outlet pipes of the modified catch basins, existing hoods will be removed and then replaced after the outlet pipes have been cleaned.

- C. The materials removed from the catch basins shall be transported immediately to the place of disposal. Materials removed on the site. No separate payment will be made for such disposal.
- D. During the cleaning operation, care shall be taken by the Contractor not to damage grates, frames, covers, hoods, the structure, or pipes. In case of damage caused by negligence of the Contractor, the damaged parts shall be satisfactorily repaired or replaced at the contractor's expense. The Contractor shall be responsible for the safe storage of all items removed and to be reset. Lost castings shall be replaced by the Contractor at no additional cost to the Owner.

90.14 NORMAL JOINT CONNECTIONS

- A. The Contractor shall make joint connections similar to those on the existing pipe or adaptable to such pipe unless specifically shown otherwise on the drawings or directed by the Engineer.

90.15 CONNECTION TO EXISTING STRUCTURES

- A. Piping to be connected to existing manholes or other similar structures where no stub or other opening has been provided shall be made through an opening of minimum diameter cut in the wall of the structure at the required elevation and location. All penetrations shall be made by core boring unless otherwise approved by the Engineer.
- B. The Contractor shall furnish and install a pipe stub, similar in material, joint detail and diameter to the pipe to be connected to the existing structure.
- C. The annular space outside of the pipe stub shall be filled and sealed with non-shrinking grout. The outer surface of the sealing mortar shall be given a coating of heavy bitumastic water-proofing compound of a type approved by the Engineer.
- D. The benchwalls within the existing structure shall be altered as required to form a new flow channel from the new connection, as shown on the Drawings or directed by the Engineer. The new channels shall be built with a smooth and continuous radius as indicated on the Detail Drawing and approved by the Engineer.

90.16 CONNECTION TO EXISTING SEWERS

- A. Sewer connections to existing sewers, and service connections constructed where there is no connection fitting or where the fitting has been damaged by or cannot be located by the Contractor shall be constructed of cast iron saddles.
- B. Existing sewers shall be tapped by mechanical tapping machines specifically designed for such work. Tapping by use of hammer and chisel shall not be allowed except if specifically authorized in writing by the Engineer.
- C. Existing sewers shall be cleaned by rodding, flushing and/or derotting as required by the Engineer and shall include proper disposal of all material removed. Cleaning shall be performed by the contractor only after receiving written authorization from the Engineer.

90.17 MANHOLES INTERCEPTING EXISTING SEWERS

- A. Where indicated on the Contract Drawings or directed by the Engineer, a manhole shall be installed to connect the existing and new sewers. The existing pipe shall not be disturbed, damaged, or altered in any manner which may disrupt its normal operation.

- B. The manhole shall be constructed by one of the following methods:
1. The placement of a precast concrete base slab, of sufficient depth to accommodate a typical invert, beneath the existing pipe. The first barrel section shall be fitted with openings to allow the passage of the existing pipe or pipes and the connection of the new pipe or pipes.
 2. A cast in place concrete base section shall be formed around the existing pipe. The formed base section shall accommodate the installation of a typical invert and also accept the remainder of the manhole precast sections or formed sections.
 3. Methods other than the above must be approved in writing by the Engineer. All precast manhole sections, cast in place manholes, concrete formwork and appurtenances shall conform to the appropriate specification sections.
- C. The existing pipe shall not rest upon or support any manhole sections. The incoming existing pipe shall be saw cut and a flexible coupling (Dresser type 38, Clow type 248 or equal) installed at a distance as indicated by the Engineer.
- D. The annular space outside of the existing pipes shall be filled and sealed with non-shrinking grout. The outer surface of the sealing mortar shall be given a coating of heavy bitumastic waterproofing compound of a type approved by the Engineer.
- E. The flow shall be altered and a new channel built only after the activation of the new sewer as noted on the Drawings and upon approval by the Engineer. The new channel shall be built with a smooth and continuous radius.

90.18 LAYING BRICK AND BLOCKS

- A. Brick and concrete blocks shall be soaked in water before laying.
- B. All joints in brick structures shall be thoroughly flushed full of mortar and no joint on the inside face shall be greater than $\frac{1}{4}$ inch. After the bricks are laid, the joints shall be pointed on the inside.
- C. As brick walls are laid up, the outside of the structure shall be plastered with $\frac{1}{2}$ inch thick mortar coat. As circular concrete block walls are laid up the horizontal joints and keyways shall be flushed full with mortar. As rectangular blocks are laid up all horizontal and vertical joints shall be flushed full with mortar. Plastering of the outside of block structures will not be required.
- D. The joints in precast units shall be wetted and completely mortared immediately prior to setting a section.
- E. No structure shall be backfilled until all mortar has completely set. When the floors of structures are made of concrete sectional plates the opening in the floor shall be filled with brick chips and mortar, cement concrete, or left open, as directed.

90.19 PLACING CASTINGS

- A. Frame castings for basins, manholes and inlets shall be set in full mortar beds true to the lines and grades as directed.
- B. Where directed the castings shall be temporarily set as such grades also provide drainage during the construction.
- C. The castings of structures located within the pavement areas shall not be completely set to the established grade until the bottom course of pavement has been laid.

- D. The final setting of all other castings shall be performed at the proper stage of construction as directed.
- E. Cement concrete collars shall be placed around the castings after the final setting as shown on the plans and as directed.

90.20 DRAINAGE OR SEWERAGE STRUCTURES ABANDONED OR REMOVED

- A. The present castings shall be carefully removed. They shall be satisfactorily stored and protected until they are required for use or until they are removed from the project by the owners.
- B. Inlets and outlets of structures to be abandoned shall be plugged with brick masonry not less than 8 inches in thickness. Upper portions of the masonry shall be removed to a depth 3-feet below the finished grade at the location designated by the Engineer, and the structures shall be completely filled with selected excavated material placed in 6 inch layers and thoroughly compacted.
- C. The existing masonry of structures to be removed shall be completely removed.
- D. The cavity shall be completely filled with selected excavated materials placed in 6 inch layers and thoroughly compacted.

END OF SECTION 33.90.00

SECTION 33.95.00

HANDLING EXISTING FLOWS

- 95.1 SCOPE OF WORK
- 95.2 RELATED WORK SPECIFIED ELSEWHERE
- 95.3 SUBMITTALS
- 95.4 PLUGGING OR BLOCKING
- 95.5 PUMPING AND BYPASSING
- 95.6 FLOW CONTROL PRECAUTIONS

95.1 SCOPE OF WORK:

- A. When sewer pipe depth of flow at the upstream manhole of the manhole section being worked on is above the maximum allowable for television inspection, the flow shall be reduced to the level shown below by operation of pump stations, plugging or blocking of the flow, or by pumping and bypassing of the flow as specified. Handling existing flows for this project will be considered incidental to all work items and no additional payment shall be made.
- B. Depth of flow shall not exceed that shown below for the respective pipe sizes as measured in the manhole when performing television inspection.

<u>Maximum Depth of Flow</u>	<u>Television Inspection</u>
6" - 10" Pipe	20% of pipe diameter
12" - 24" Pipe	25% of pipe diameter

- C. During any pipe lining process, the Contractor shall provide for the bypassing of sewage entering or passing through the pipe to be rehabilitated.
- D. During any manhole rehabilitation process, the Contractor shall provide for the bypassing of sewage entering or passing through the manhole to be rehabilitated when inverts are sealed or coated.

95.2 RELATED WORK SPECIFIED ELSEWHERE

- A. SECTION 01.11.00 SUMMARY OF WORK
- B. SECTION 01.33.00 SUBMITTALS

95.3 SUBMITTALS

The contractor shall provide a written description of the means and methods to be utilized to handle existing flows within the sewers for approval by the engineer prior to commencing any operations.

95.4 PLUGGING OR BLOCKING

A sewer line plug shall be inserted into the line upstream of the section being worked. The plug shall be so designed that all or any portion of the sewage can be released. During TV inspection, testing and sealing operations, flow shall be reduced to within the limits specified above. After the work has been completed, flow shall be restored to normal.

95.5 PUMPING AND BYPASSING

When pumping and bypassing is required, the Contractor shall supply the pumps, conduits, and other equipment to divert the flow of sewage around the manhole section in which work is to be performed" The bypass system shall be of sufficient capacity to handle existing flow plus additional flow that may occur during a rainstorm. The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum.

95.6 FLOW CONTROL PRECAUTIONS

When flow in a sewer line is plugged, blocked, or bypassed; sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to insure that flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

END OF SECTION