



Salem State University

JONES ARCH

PROJECT MANUAL

ADMINISTRATION BUILDING ROOF AND SIDEWALK REPLACEMENT
Salem State University – North Campus
Salem, MA

MASS. STATE PROJECT NO. SSU-2021-A Contract #1
CAMIS NO. J226800
JONES ARCHITECTURE PROJECT NO. 2011

July 31, 2020
100% Construction Documentation

Architect of Record:
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978.744.5200

DOCUMENT 000110

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END OF DOCUMENT

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ATTENTION CONTRACTORS & SUBCONTRACTORS
(EFFECTIVE AUGUST 1, 2006)

ALL CONTRACTORS AND SUBCONTRACTORS PLEASE NOTE THE NEW DCAM CONTRACT PROVISIONS REQUIRING CONFIRMATION OF HIRING PRACTICES IN ACCORDANCE WITH FEDERAL DEPARTMENT OF HOMELAND SECURITY REQUIREMENTS. THIS INCLUDES BUT IS NOT LIMITED TO THE FAITHFUL COMPLETION OF THE **FORM I-9** PROCESS FOR ALL PERSONS TO BE EMPLOYED IN THE WORK OF THE PROJECT WHO ARE REQUIRED TO BE LISTED ON THE CERTIFIED PAYROLL REPORTS. THE CONTRACTOR AND ALL SUBCONTRACTORS MUST: 1) EXECUTE ALONG WITH ITS CONTRACT/ SUBCONTRACT AN CERTIFICATE OF COMPLIANCE WITH EMPLOYMENT ELIGIBILITY VERIFICATION REQUIREMENTS, AND 2) MUST CERTIFY IN EACH CERTIFIED PAYROLL REPORT SUBMITTED TO DCAM, THAT THE FORM I-9 PROCESS WAS FAITHFULLY COMPLETED FOR ALL EMPLOYEES LISTED ON EACH CERTIFIED PAYROLL REPORT.

SEE NOTICE TO BIDDERS AND GENERAL CONDITIONS

ATTENTION CONTRACTORS & SUB-CONTRACTORS
(EFFECTIVE JULY 1, 2006)

A NEW LAW, CHAPTER 306 OF THE ACTS OF 2004, REQUIRES 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 ALL CONTRACTORS, SUBCONTRACTORS AND OTHERS WORKING AT THE SITE/ SHALL FURNISH DOCUMENTATION OF SUCCESSFUL COMPLETION OF SAID COURSE WITH THE FIRST CERTIFIED PAYROLL REPORT FOR EACH EMPLOYEE.

ATTENTION FILED SUB-BIDDERS
(EFFECTIVE JANUARY 1, 2006)

**A VALID SUB-BIDDER CERTIFICATE
OF ELIGIBILITY ISSUED BY THE DIVISION
OF CAPITAL ASSET MANAGEMENT (DCAM)
IN THE CATEGORY OF WORK OF YOUR
SUB-BID AND A COMPLETED SUB-BIDDER
UPDATE STATEMENT MUST ACCOMPANY
EACH AND EVERY FILED SUB-BID SUBMITTED.**



BID PACKAGE

PART I

INSTRUCTIONS TO BIDDERS

Instructions to Bidders

Attachment A: Minimum Wage Rates

Attachment B: Forms Used During Bidding

Sample Certificate of Eligibility – Prime Bidder

Sample Sub-bidder Certificate of Eligibility

Update Statement – Prime Bidder

Sub-bidder Update Statement

Blanket Deposit Bond

Form for General Bid

Form for Sub-Bid

BIDDER CHECKLIST

This is not a contract document. It is provided to help bidders avoid common mistakes that can result in the rejection of bids. It does not modify the Contract Documents.

To ensure that your bids are acceptable to the Department, and are not rejected due to errors or omissions, we are providing this Checklist for your convenience.

- 1. Have you used the correct bid form provided in Attachment B to the Instructions to Bidders?
- 2. Have you properly identified the project, architect, etc., on your bid form?
- 3. Are your bid amounts, as expressed in figures and words, consistent?
The amount expressed in words will control.
- 4. Have you acknowledged all addenda issued, and followed the instructions contained in each one?
- 5. If you are a general bidder, have you responded to every alternate? If you are a sub-bidder, have you responded to all of those alternates identified as applying to the filed sub-bid section you are bidding on?
- 6. If you are a general bidder or a sub-bidder affected by an alternate and an alternate price is requested and you estimate that there is no change in price, did you indicate by writing "**no change**", "**N/C**", or "**0**"? Failure to provide a price, no change, N/C or 0 for an alternate by general bidders and by sub-bidders when identified as part of a sub-bidders scope of work will result in rejection of your bid.
- 7. If you are a sub-bidder and the alternate does not affect your category of work, have you left the alternate blank or written "**N/A**" and only "**N/A**"?
- 8. If you are a sub-bidder and the bid documents request that you supply the name of the firm(s) that will do certain work identified as sub-subcontract Paragraph E work, have you completed the Paragraph E section?
- 9. Have you added any information not called for, acknowledged an addendum that does not exist, or provided a price for an alternate not identified as part of your scope of work which can result in rejection of your bid?
- 10. Is your Bid Form **SIGNED** and dated?
- 11. **Bid Deposits**
 - a. Is your bid deposit, if in the form of a bid bond, issued from a bonding company licensed to do business in the Commonwealth of Massachusetts? **Is it signed by the contractor and the bonding company?** Passbooks or Letters of Credit from a bank are not acceptable as a bid deposit.
 - b. Is your bid deposit made payable to the Commonwealth of Massachusetts? **Bid deposits made payable to any other entity may cause the bid to be rejected.**
 - c. Is your bid deposit five (5%) of the highest possible bid amount, considering all alternates being accepted in order?
- 12. If you are a General Contractor, have you included your current Certificate of Eligibility and a **completed, signed** Update Statement (DCAM Form CQ3)? See Attachment B of the Instructions to Bidders for a blank form of Update Statement.
- 13. If you are a Filed Sub-Bidder, have you included your current Sub-Bidder Certificate of Eligibility and a **completed, signed** Sub-Bidder Update Statement? See Attachment B of the Instructions to Bidders for a blank form of Sub-Bidder Update Statement.
- 14. Are all of your bid materials enclosed in a sealed envelope and labeled with the project information exactly as provided in the Instructions to Bidders?
- 15. Your bid **MUST** be received by the Awarding Authority prior to the deadline!



**COMMONWEALTH OF MASSACHUSETTS
INSTRUCTIONS TO BIDDERS**

Awarding Authority:

Salem State University
Facilities Department
Stanley Building, Second Floor
70 Loring Avenue
Salem, MA 01970
Telephone: (978) 542-6004

Mass. State Project No. SSU-2021-A

Contract No. 1

Title: SSU – Administration Building Roof & Sidewalk Replacement

Category of Work: General Building Construction

Project Description and Scope: Located at 352 Lafayette Street, the “SSU – Administration Building Roof Replacement” project primarily consists of replacing the existing EPDM roof with a fully adhered white PVC roof membrane. The Work also includes, but is not limited to, reconfiguring the front entrance to the building, and repairing a leaking concrete underground connecting tunnel. This work will be pre-ceded by an infra-red roof scan to note any deficiencies in the sub-structure and the roof will be rescanned after the project in order to determine any deficiencies in the work performed. This project will be performed in an existing building and services to the building will be expected to be consistent and maintained throughout the project. Part of this building is referred to as the Commons Dining hall and has a fully functional kitchen that will also have to be coordinated and full functional during construction.

Contractor Use of the Site: As noted in the passage directly above, the Administration Building will be occupied during the entire Project. The Contractor and its forces shall therefore cooperate fully with the Owner in order to minimize conflicts and to facilitate the Owner’s use of the building. The Contractor shall organize its Work in a way that minimizes interruption of services and prevents fumes from entering occupied spaces. The timing and duration of necessary interruptions to building systems shall be coordinated with Owner at least 72 hours in advance, exclusive of weekends and Owner-observed legal holidays, and interruptions shall be executed on premium time (late night or early morning) at no change in Contract time and Contract Price.

Pre-Bid Meeting Information (if any): A pre-bid walk-through for all bidders will be held on site starting at 2:00 p.m. on Thursday, August 20, 2020; all questions regarding the project should be submitted at this time. Salem State University Contact: Facilities Office, 978-542-6004.

Deadline for filing filed Sub-bids is 11:00 a.m. on September 3, 2020

Deadline for filing General bids is 11:00 a.m. on September 10, 2020

The list of filed subtrades for this project is found at Page 3 of these Instructions to Bidders.

The minimum wage rate requirements for this Contract is located in Attachment A to these Instructions to Bidders.

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

The Contractor must provide written verification as detailed in the General Conditions at Article X, of compliance with Massachusetts and federal laws with respect to the employment of workers and Federal Department of Homeland Security Requirements, including, but not limited to, the Employment Eligibility Verification (Form I-9) Process.

Bid forms for this Contract are located in Attachment B to these Instructions to Bidders.

The Minority Business Enterprise and Women Business Enterprise (MBE/WBE) participation goal for this Contract is a combined goal of 5 %. The combined goal requires a reasonable representation of both MBE and WBE firm participation on the project as further set forth in Section 8 below and the general conditions of the contract.

The applicable minority workforce utilization percentage is 5 %.

The applicable women workforce utilization percentage is 5 %.

The time for completion of the Work is specified in Article 2 of the Owner - Contractor Agreement. Liquidated damages for failure to complete work on time are as stated in Article 8 of the Owner - Contractor Agreement.

Bidding Documents may be examined at the Agency address indicated above, and sets of documents may be obtained there by depositing a company, treasurer's, cashier's, or bank check in the per set sum of \$100.00, payable to Salem State University ("SSU"); within 10 working days after the general bid opening refund will be made to those who return bidding documents in satisfactory condition. SSU will not mail or email the documents. Please note that mail is not delivered directly to the Facilities Department; it is instead routed through the central campus mail room. SSU therefore assumes no responsibility for bids not received at the Facilities Department by the applicable deadline. SSU requests that you call, not email, in advance of coming to pick up documents.

The filed subtrades for this project are as follows:

Section #	Filed Subtrade	All Bid Deposits 5% of Bid Amount
Section 04	Masonry	
Section 05	Misc and Ornamental Iron	
Section 07	Roofing & Flashing	
Section 07	Waterproofing	
Section 09	Painting & Coating	
Section 22	Plumbing	
Section 23	HVAC	
Section 26	Electrical	

As used herein, capitalized terms shall have the meaning assigned to them in the General Conditions of the Contract and the Owner - Contractor Agreement unless the context clearly indicates otherwise.

SECTION I - BIDDER'S REPRESENTATION

1.1 Each general bidder or sub-bidder (hereinafter sometimes referred to as "Bidder") by making a bid or sub-bid (hereinafter sometimes referred to as "Bid") represents and warrants that Bidder has visited and examined the Site and the Contract Documents, that Bidder is familiar with the local conditions under which the Work is to be performed, that Bidder has correlated personal observations with the requirements of the Contract Documents, and that where the Contract Documents require, in any part of the Work, a given result to be produced, the Contract Documents are adequate and that Bidder will produce the required result within the Bid price and that the Bid is made in accordance therewith.

1.2 Failure to so examine the Contract Documents and the Site will not relieve any Bidder from any obligation under the Bid as submitted. Neither the Commonwealth nor the Designer will be responsible for errors, omissions and/or charges for extra work arising from Bidder's failure to familiarize itself with the Contract Documents or existing conditions.

SECTION 2 -- GENERAL BIDDERS - CERTIFICATE OF ELIGIBILITY AND UPDATE STATEMENT

2.1 Every general bidder must submit the following with its general bid:
 --A Prime/General Contractor Certificate of Eligibility issued by the Division of Capital Asset Management and Maintenance ("DCAM"), showing that the Bidder has been approved to bid on projects for the category of work required and that the Bidder has a single project limit in an amount no lower than the amount of its Bid including all "add" alternates.
 --A fully completed Prime/General Contractor Update Statement.

2.2 It is the Bidder's responsibility to obtain the necessary forms from DCAM and to submit its Application for Certificate of Eligibility so as to allow sufficient time for DCAM's evaluation of the application and issuance of a Certificate of Eligibility prior to the deadline for bidding.

2.3 The Prime/General Contractor Update Statement is not a public record as defined in M.G.L. c. 4, § 7 and will not be open to public inspection.

SECTION 3 – FILED SUB-BIDDERS - CERTIFICATE OF ELIGIBILITY AND UPDATE STATEMENT

3.1 Every filed sub-bidder must submit the following with each filed sub-bid:

--A Sub-Bidder Certificate of Eligibility issued by the Division of Capital Asset Management and Maintenance ("DCAM") for that sub-bid trade, showing that the sub-bidder has been approved to bid on projects of the category of work required.

--A fully completed Sub-Bidder Update Statement.

3.2 It is the sub-bidder's responsibility to obtain the necessary forms from DCAM and to submit its Application for Sub-bidder Certificate of Eligibility so as to allow sufficient time for DCAM's evaluation of the application and issuance of a Sub-Bidder Certificate of Eligibility prior to the deadline for bidding.

3.3 The Sub-Bidder Update Statement is not a public record as defined in M.G.L. c. 4, §7 and will not be open to public inspection.

SECTION 4 -- REQUESTS FOR INTERPRETATION

4.1 Any questions by prospective Bidders concerning interpretation of the Contract Documents must be submitted in writing to the Awarding Authority and should be in its possession at least ten working days before the date set for the receipt of general bids, or, if a question pertains to Item 2 filed sub-bid work, at least ten working days before the date set for the receipt of filed sub-bids. The Awarding Authority will mail any addenda or written interpretations that it deems necessary to Bidders who have taken out plans at the address given by them before the date set for the receipt of affected Bids. Bidders may not rely upon oral communications or interpretations from the Awarding Authority or the Designer and the Awarding Authority shall not be bound by them.

4.2 It is the sole responsibility of the Bidder to ascertain the existence of any addenda issued by the Awarding Authority, whether or not the same are mailed to, or received by, Bidder. Copies of addenda will be made available for inspection at the locations listed in the Advertisement where the Contract Documents are on file.

4.3 Wherever in the Contract Documents reference is made to Massachusetts General Laws, it shall be construed to include all amendments thereto effective as of the date of the issuance of the invitation to bid on the proposed work.

SECTION 5 -- PREPARATION OF BIDS; ALTERNATES

5.1 General Bids shall be submitted on the Form for General Bid included in Attachment B to these Instructions to Bidders. Filed sub-Bids shall be submitted on the Form for Sub-Bid included in Attachment B to these Instructions to Bidders.

5.2 All entries on the Bid form shall be typewritten or in ink.

5.3 Where so indicated on the bid form, sums shall be expressed in both words and numerals. Where there is a discrepancy between the Bid sum expressed in words and the Bid sum expressed in figures, the Bid sum expressed in words shall control unless the intention of the Bidder clearly is otherwise as determined by the Awarding Authority in its sole discretion.

5.4 Each general bidder shall acknowledge all required alternates in Section C on the Form for General Bid by entering the dollar amount of addition or subtraction necessitated by each alternate. General Bidders shall enter on the Form for General Bid a single amount for each alternate that shall consist of the sub-bidders' amounts and the amount for work performed by the general bidder.

5.5 If an alternate includes work within the Bidder's scope of work and does not involve a change in the cost of the Bid, the Bidder shall so indicate by writing "No Change" or "N/C" or "0" in the space provided for that alternate. Sub-bidders shall enter on the Form for Sub-Bid the amount of addition or subtraction necessitated **only** for those alternates expressly identified in the Bid Documents as part of the sub-bidder's category of work. If the alternate is not identified in the Bid Documents as affecting the sub-Bidder's category of work then the sub-Bidder shall so indicate by writing "N/A" **and only "N/A"** or leaving the alternate blank.

5.6 The lowest Bidder will be determined on the basis of the sum of the base Bid and the accepted alternates.

5.7 If the space for indicating a requirement for payment and performance bonds for filed sub-bidders is left blank by the general bidder on the Form for General Bid, the Awarding Authority shall interpret this as a "No."

5.8 Costs for the selected filed sub-bidder's bond premiums shall be paid for by the selected general bidder in accordance with M.G.L. c. 149, § 44F unless the project is a project in which contractor and subcontractor prequalification are required pursuant to M.G.L. 149, §§ 44D1/2 or 44D3/4.

5.9 If the general bidders are instructed to carry an amount for a given subtrade listed under Item 2, general bidders shall list the subtrade and the amount provided by the Awarding Authority. The line under "bonds required" on the Form for General Bid should be left blank or marked "N/A" in order for subsection 5.10 to apply.

5.10 Upon solicitation of a subcontractor to perform the work required with respect to a subtrade referenced in subsection 5.9, the general bidder's Contract Price shall be adjusted

by the following: a) the difference between the subcontract amount and the amount carried in the general bid; b) the total cost of the subcontractor's bonds, if the general bidder requires such bonds after the solicitation is completed and if the general bidder complied with 5.9 above; c) the documented increased costs for the general bidder's bonds, if any, attributable to the incremental difference between the amount carried for the given subtrade and the actual subcontract amount.

5.11 Overhead and profit for supervision of the subtrade mentioned in subsections 5.9 and 5.10 above shall be included by all general bidders in Item 1 of the subdivision of the Contract Price. No additional overhead or profit will be paid on the incremental difference between the amount carried for the subtrade and the subcontract amount as stated in M.G.L. c. 149, § 44F(4)(a)(2).

5.12 Sub-bidders should not list Paragraph E sub-subcontractors unless requested to do so by the Awarding Authority.

5.13 Each general bid and each Bid of a filed sub-bidder must be accompanied by a bid deposit in the form of a bid bond; cash; or a check certified by, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to the Commonwealth of Massachusetts. Any bid bond shall be (a) in a form satisfactory to the Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth and (c) conditioned upon the faithful performance by the principal of the agreements contained in the Bid.

5.14 The amount of such bid deposit shall be **5% five per cent** of the value of the Bid including alternates.

SECTION 6 - SUBMISSION OF BIDS

6.1 Each sub-bid, **including the bid deposit, DCAM Sub-Bidder Certificate of Eligibility and properly completed DCAM Sub-Bidder Update Statement** using the most recent form available on DCAM's website shall be enclosed in a sealed envelope with the following plainly marked on the outside:

Filed Sub-Bid for:

Mass. State Project No. SSU-2021-A

Contract No. 1

Title: SSU - Administration Building Roof and Sidewalk Replacement

Sub-Bid Section No. _____

Trade:

Sub-Bidders name, business address, and telephone number.

6.2 Each general bid, including the bid deposit, DCAM Prime/General Contractor Certificate of Eligibility, and properly completed DCAM Prime/General Contractor Update Statement, using the most recent form available on DCAM’s website shall be enclosed in a sealed envelope with the following plainly marked on the outside:

General Bid for:

Mass. State Project No. SSU-2021-A

Contract No. 1

Title: SSU - Administration Building Roof and Sidewalk Replacement

General Bidders name, business address, and telephone number.

6.3 All Bids must be received by the Awarding Authority at the address specified on page 1 of these Instructions to Bidders no later than the applicable date and time specified on page 1 of these Instructions to Bidders. Any Bid not received by the applicable deadline will not be accepted.

6.4 Bidding results will not be given out over the telephone prior to 1:00 PM of the day following the Bid opening.

SECTION 7 - WITHDRAWAL OF BIDS; REJECTION OF BIDS

7.1 Any Bid may be withdrawn prior to the specified deadline for the receipt of Bids provided that the withdrawal shall be made by a written request signed by a person having the authority to bind the Bidder. The written request must be hand delivered or otherwise delivered to the Awarding Authority’s Bid Room addressed to the attention of the Bid Room Manager and must be received on or before the date and time appointed as the deadline for the receipt of Bids.

7.2 A Bidder may withdraw its Bid without penalty at any time up to the time of Award as defined below in subsection 9.1 only upon demonstrating to the satisfaction of the Awarding Authority that a death or disability has occurred or a bona fide clerical or mechanical error of a substantial nature was made during the preparation of the bid. Failure to demonstrate conclusively that a bona fide clerical or mechanical error of a substantial nature was made may result in forfeiture of the Bid Deposit.

7.3 The Awarding Authority reserves the right to waive any informality in or to reject any and all Bids if it is in the public interest to do so. Without limiting the foregoing, the Awarding Authority reserves the right to reject unit prices which it deems unduly high or unduly low as unbalanced.

SECTION 8 – MBE/WBE PARTICIPATION

8.1 The apparent low Bidder's compliance with the requirements of this Section 8 is a prerequisite for receiving the Award of the Contract.

8.2 The Supplier Diversity Office (“SDO”) certified Minority Business Enterprise (“MBE”) and Women Business Enterprise (“WBE”) (collectively “MBE/WBE”) participation goals for this Contract are as set forth on the second page of these Instructions to Bidders. The successful Contractor must utilize a mix of both MBE and WBE firms whose participation, when added together, meets the overall combined goal set for the Contract. It is important that both MBE and WBE firms have an opportunity to work on public projects with a combined MBE/WBE goal. Therefore, projects with a combined goal must include a reasonable representation of both MBE and WBE firms to meet the combined goal. Proposed MBE/WBE participation plans that include solely MBE or solely WBE participation, or have only nominal participation by one or the other to meet the combined goal, will not be considered responsive. Contractors that are themselves MBE or WBE certified will be required to bring a reasonable amount of participation by a firm(s) that holds the certification which is not held by the Contractor to the project. Although the Contract contains a combined goal, participation by MBE and WBE firms must be reported and tracked separately.

8.3 The Awarding Authority reserves the right to reduce or waive the MBE/WBE participation goals established for this Contract upon written request made by a general bidder within the time frame set forth in Section 8.3. Such written request must demonstrate to the satisfaction of the Awarding Authority that it is not feasible for a non-MBE or non-WBE general bidder to meet the goals established for this Contract based upon any or all of the following: (i) actual MBE/WBE availability, (ii) the geographic location of the project to the extent related to MBE/WBE availability, (iii) the scope of the work, (iv) the percentage of work available for subcontracting to MBE/WBEs and/or (v) other relevant factors, including a **documented** inability by the prospective Bidder to obtain commitments from MBE/WBE subcontractors sufficient to meet the MBE/WBE goals after having made a diligent, good faith effort to do so. All of the foregoing documentation shall accompany the Bidder's request for a reduction or waiver of the MBE/WBE participation goals. Such documentation shall include, at a minimum, the following:

-- A list of all items of work under the Contract that the Bidder made available for subcontracting to MBE/WBEs. The Bidder shall identify all items of work, other than work to be performed by filed sub-bidders, that the Bidder did not make so available and shall state the reasons for not making such work available for subcontracting to MBE/WBEs. The Bidder shall also demonstrate that, where commercially reasonable, subcontracts were divided into units capable of being performed by MBE/WBEs.

-- Evidence that the Bidder sent written notices soliciting Bids or proposals to perform the items of work made available by the Bidder for subcontracting to MBE/WBEs to all MBE/WBEs qualified to perform such work. The Bidder shall identify (i) each MBE/WBE solicited, and (ii) each MBE/WBE listed in the Supplier Diversity Office (SDO) directory under the applicable trade category that was not solicited and reasons therefor. The Bidder shall

also state the dates that notices were mailed and provide a copy of the written notice(s) sent.

-- Evidence that the Bidder made reasonable efforts to follow up the written notices sent to MBE/WBEs with telephone calls or personal visits in order to determine with certainty whether the MBE/WBEs were interested in performing the work. Phone logs or other documentation must be submitted.

-- A statement of the response received from each MBE/WBE solicited, including the reason for rejecting any MBE/WBE who submitted a bid or proposal.

-- Evidence of efforts made to assist MBE/WBEs that needed assistance in obtaining bonding or insurance, or lines of credit with suppliers if the inability of MBE/WBEs to obtain bonding, insurance, or lines of credit is the reason given for the Bidder's inability to meet the MBE/WBE goals.

The Bidder may also submit any other information supporting its request for a waiver or reduction in the MBE/WBE participation goals, including, without limitation, evidence that the Bidder placed advertisements in appropriate media and trade association publications announcing the Bidder's interest in obtaining bids or proposals from MBE/WBEs, and/or sent written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the Contract and the work to be subcontracted by the Bidder to MBE/WBEs. The Bidder shall also submit any other information reasonably requested by the Awarding Authority to show that the Bidder has taken all actions that could reasonably be expected to achieve the MBE/WBE participation goals.

8.4 If filed sub-bids are solicited for this Contract, requests from prospective general bidders to reduce or waive the MBE/WBE participation goals for this Contract must be received by the Awarding Authority **no later than four (4) working days after the list of filed sub-Bidders is mailed by the Awarding Authority to persons who have taken out plans for the Contract.** If there are no filed sub-bids solicited for this Contract, requests to reduce or waive the MBE/WBE participation goals for this Contract must be received by the Awarding Authority no later than fourteen (14) calendar days before the date set for the receipt of general bids. **THE AWARDING AUTHORITY WILL NOT CONSIDER ANY REQUEST TO REDUCE OR WAIVE THE MBE/WBE PARTICIPATION GOALS FOR THIS CONTRACT THAT IS RECEIVED AFTER THESE DEADLINES.** Any reduction or waiver of the MBE/WBE participation goals for this Contract will be made by written addendum mailed to all persons who have taken out plans for the project.

8.5 No later than five (5) working days after the opening of general bids, the apparent low Bidder shall submit the following documents to the Awarding Authority's Compliance Office: (i) a completed Schedule for Participation by Minority/Women Business Enterprises ("Schedule for Participation") in the form provided by the Awarding Authority showing MBE/WBE participation in amounts equal to or exceeding the MBE/WBE participation goals for this Contract, (ii) a completed Letter of Intent in the form provided by the Awarding Authority for each MBE/WBE listed in the Schedule for Participation, and (iii) a current SDO

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

8.6 Each Letter of Intent shall identify and describe the work to be performed by the named MBE/WBE (the "MBE/WBE Work") with enough specificity to permit the Awarding Authority to identify the particular items of contract work that the MBE/WBE will perform for MBE/WBE participation credit. The Awarding Authority reserves the right to reject any Letter of Intent if the price to be paid for the MBE/WBE Work does not bear a reasonable relationship to the value of such work under the Contract as determined by the Awarding Authority.

8.7 Within five (5) working days after receipt of the Schedule for Participation, Letters of Intent, and SDO certification letters, the Awarding Authority shall review and either approve or disapprove the apparent low Bidder's submissions. If the apparent low Bidder has not submitted an appropriate Schedule For Participation and appropriate Letters of Intent and SDO certification letters establishing that the MBE/WBE participation goal for the project will be met, the apparent low Bidder will be considered ineligible for Award of the Contract and the Awarding Authority will Award the Contract to the second lowest Bidder, subject to said Bidder's compliance with these conditions.

8.8 The Bidder's attention is called to Article XIII of the General Conditions of the Contract which requires the Contractor to submit, within 30 days of the Contract Date, signed subcontracts with all subcontractors or a purchase order or invoice from each material supplier and/or manufacturer listed on the Schedule for Participation.

8.9 A filed sub-bidder is not required to submit a Schedule for Participation with its Bid. A filed sub-bidder may, at its option, submit a Letter of Intent with its Bid if it is a SDO certified MBE/WBE. If a filed sub-bidder intends to sub-subcontract work to a SDO certified MBE/WBE, and the filed sub-bidder wishes that sub-subcontract or purchase order to be credited toward the participation goals for this Contract, the filed sub-bidder should submit a Letter of Intent from that MBE/WBE either with its Bid or after award of the subcontract. A filed sub-bidder can subcontract out up to 20% of its work to MBE/WBEs unless such work is designated as sub-sub contract Paragraph E work in the Bid Documents in which case the 20% cap does not apply.

SECTION 9 -- CONTRACT AWARD

9.1 "Award" means the determination, selection, and notification of the lowest, responsible and eligible Bidder by the Awarding Authority.

9.2 The Awarding Authority will award the Contract within thirty days, Saturdays, Sundays, and legal holidays excluded after the opening of Bids in accordance with M.G.L. c.149 §44A.

9.3 The Contract will be awarded to the lowest responsible and eligible Bidder as determined by the Awarding Authority, except in the event of substitution as provided under M.G.L. c.149,

§§44E and 44F, in which cases the procedure as required by said sections shall govern the award of the Contract.

9.4 As used herein, the term "lowest responsible and eligible Bidder" shall mean the general bidder whose Bid is the lowest of those Bidders who, in the Awarding Authority's opinion, are ready, willing and able to comply with all requirements of the Contract Documents and demonstrably possess the skill, ability, and integrity necessary for the faithful performance of the Work, based on the determination of past performance and financial soundness under (i) M.G.L. c.149 §44A and following sections, (ii) the rules, regulations, orders, guidelines and policies promulgated from time to time by the Commissioner of the Division of Capital Asset Management and Maintenance ("DCAM") and (iii) any other relevant criteria that the Commissioner may prescribe. If the Awarding Authority determines that any non-filed subcontractor chosen by a Bidder is not qualified or responsible, then the Bidder shall obtain another subcontractor satisfactory to Awarding Authority and the contract price shall not be adjusted.

9.5 The general bid price shall be the price set forth in paragraph C of the Form for General Bid. No general Bid shall be rejected (i) because the sum of the prices set forth in Item 1 and 2 does not equal the general bid price set forth in said paragraph C or (ii) because of one or more errors in setting forth the name, the sub-bid price of a sub-bidder, or the total of Item 2, provided that the sub-bidder or sub-bidders designated are clearly identifiable, or (iii) because the plans and specifications do not accompany the Bid or are not submitted with the Bid.

9.6 Should the Contract Documents require submission of special data to accompany the Bid, the Awarding Authority reserves the right to rule the Bidder's failure to submit such data an informality and to receive said data subsequently within a reasonable time as set by the Awarding Authority, provided that no such ruling shall result in an unfair advantage to the Bidder.

9.7 The Awarding Authority also reserves the right to reject any sub-bid if it determines that such sub-bid does not represent the Bid of a person competent to perform the work as specified, or if fewer than three sub-bids are received for a sub-trade, and the Bid prices are not reasonable for acceptance without further competition.

9.8 If the Awarding Authority decides to reject all general bids or if the Awarding Authority does not receive any general bids, the Awarding Authority may retain and use the sub-bids received for a second opening of general bids; provided, however, that there are no changes in the work involved for the subtrades for which the sub-bids are so retained and used; and provided, further, that the Awarding Authority shall obtain the consent of each sub-bidder included in any award of a general Contract made pursuant to the second opening of general bids if such award is not made within ninety days, Saturdays, Sundays and legal holidays excluded, after the opening of such sub-bids.

SECTION 10 - EXECUTION OF CONTRACTS

10.1 If a selected filed sub-bidder fails, within five days, Saturdays, Sundays and legal holidays excluded, after presentation of a Subcontract by the general bidder to which the Contract was awarded, to perform its agreement to execute a Subcontract in the form provided by the Awarding Authority with such general bidder contingent upon the execution of the general Contract, and, if requested to do so by such general bidder in the general bid, to furnish a performance and a payment bond as stated in its filed sub-bid, such general bidder and the Awarding Authority shall select from the other filed sub-bids duly filed with the Awarding Authority for such subtrade and not rejected the lowest responsible and eligible filed sub-bidder at the amount named in its filed sub-bid as so filed against whose standing and ability the general Contractor makes no objection, and the Contract price shall be adjusted by the difference between the amount of such filed sub-bid and the amount of the sub-bid of the delinquent filed sub-bidder.

10.2 Upon receipt of the Award, the general bidder awarded the Contract shall submit three (3) properly executed originals of each of the following documents prior to execution of the Contract by the Awarding Authority. All such documents shall be in the form prescribed by the Awarding Authority. Note: The successful general bidder must submit its Schedule for Participation of Minority/Women Business Enterprises and Letters of Intent as set forth in Section 8.4 above prior to Award of the Contract.

- Owner-Contractor Agreement
- Certificate of Corporate Vote
- Certificate of Joint Venture (if appropriate)
- Certificate of Compliance with State Tax Laws and with Unemployment Compensation Contribution Requirements
- Workforce Certification
- Executive Order 504 Contractor Certification Form
- DCAM Trench Application and Permit
- Performance and Payment Bonds with power of attorney attached
- Certificates of Insurance evidencing coverages in amounts required by the Contract Documents

-Written representation by the General Contractor to the effect that it has presented subcontracts to all selected filed sub-bidders and a statement as to whether or not each such selected filed sub-bidder has executed its subcontract such that the Awarding Authority may release the Bid Deposit with respect to the same. **Misrepresentation of the foregoing shall render the General Contractor liable to the Awarding Authority for the sum of any Bid Deposit released by the Awarding Authority with respect to a filed sub-bidder that fails to execute its subcontract.**

-Any other documents that the Awarding Authority may reasonably require in connection with the Contractor's execution of the Contract.

10.3 Please note that **no part of the General Contractor's work may be subcontracted without the prior written approval of the Awarding Authority.** If the General Contractor desires to subcontract any part of the Work, other than work covered by Item 2, filed sub-bidders, the General Contractor must promptly forward to the Awarding Authority a list in

triplicate designating the work to be performed and the name of each proposed subcontractor for approval by the Awarding Authority. Approved subcontractors are eligible for direct payments under M.G.L. 30, § 39F, as amended. Material suppliers not involving site labor need not be submitted for approval.

SECTION 11 - RETURN OF BID DEPOSITS

11.1 All Bid Deposits of general bidders, except those of the three (3) lowest responsible and eligible general bidders, shall be returned within five (5) days, Saturdays, Sundays and legal holidays excluded, after the opening of the general bids. The Bid Deposits of the three (3) lowest responsible and eligible general bidders shall be returned upon the execution and delivery of the General Contract or, if no award is made, upon the expiration of the time prescribed in M.G.L. c. 149, § 44A for making an award; except that, if any general bidder fails to perform its agreement to execute the Contract and furnish Performance and Payment Bonds as stated in its Bid, then said general bidder's Bid Deposit shall become the property of the Commonwealth as liquidated damages; provided that the amount of the Bid Deposit that becomes the property of the Commonwealth shall not exceed the difference between the Contractor's Bid price and the Bid price of the next lowest responsible and eligible Bidder; and provided further that, in the case of death, disability, bona fide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the general bidder, such general bidder's Bid Deposit shall be returned.

11.2 All Bid Deposits of sub-bidders, except (i) those of the sub-bidders named in the general bids of the three (3) lowest responsible and eligible general bidders and (ii) those of the three (3) lowest responsible and eligible sub-Bidders for each subtrade, shall be returned within five (5) days, Saturdays, Sundays and legal holidays excluded, after the opening of the general bids. The Bid Deposits of sub-bidders not returned pursuant to the provisions of the preceding sentence shall be returned within five (5) days, Saturdays, Sundays, and legal holidays excluded, after the execution of the General Contract; except that, if a selected sub-bidder fails to perform its agreement to execute a sub-contract with the general bidder selected as the general contractor, contingent upon the execution of the General Contract, and, if requested to do so in the general bid by such general bidder, to furnish a Performance and Payment Bonds as stated in its sub-bid in accordance with M.G.L. c. 149, § 44F(2), the Bid Deposit of such sub-bidder shall become the property of the Commonwealth as liquidated damages, provided that the amount of the Bid Deposit that shall become the property of the Commonwealth shall not exceed the difference between its sub-bid price and the sub-bid price of the next lowest responsible and eligible sub-bidder.

11.3 In addition to the provisions for the return of Bid Deposits as provided above, upon receipt of a Bid Bond in an amount not less than the amount of the required Bid Deposit, the Awarding Authority shall return any Bid Deposit of a Bidder forthwith after the public opening of Bids.

ATTACHMENT A

PREVAILING WAGE SCHEDULE

The minimum wage rates provided in the following pages have been provided by the Division of Occupational Safety of the Massachusetts Department of Labor and Workforce Development. The Awarding Authority is not responsible for errors or omissions in such wage rates. Prevailing Wage Schedules will be updated annually through the duration of the project.

M.G.L. c. 149, §§ 26 and 27 provide as follows:

" . . . Payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided.

. . . The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in said section twenty-six, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, a pension plan and a supplementary unemployment benefit plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction "

Mass General Laws c. 149, §27, as amended on August 8, 2008 requires annual updates to prevailing wage schedules for all public construction projects lasting longer than one year. The Contractor is required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The Contractor and all Subcontractors are required to anticipate such annual updated prevailing wage schedules and neither the Contractor nor any Subcontractors shall be entitled to claim additional compensation for base contract work due to updated prevailing wage schedules.



CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the
Massachusetts General Laws, Chapter 149, Sections 26 to 27H

ROSALIN ACOSTA
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority: Salem State University
Contract Number: SSU-2021-A, Contract #2 **City/Town:** SALEM
Description of Work: Administration Building Roof Replacement
Job Location: 352 Lafayette Street

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the “Wage Request Number” on all pages of this schedule.
 - An Awarding Authority must request an updated wage schedule from the Department of Labor Standards (“DLS”) if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
 - The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
 - All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
 - The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F “rental of equipment” contracts.
 - Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee’s name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at <http://www.mass.gov/dols/pw>.
 - Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
 - Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
 - Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2020	\$35.15	\$12.41	\$13.72	\$0.00	\$61.28
	08/01/2020	\$35.15	\$12.91	\$13.72	\$0.00	\$61.78
	12/01/2020	\$35.15	\$12.91	\$14.82	\$0.00	\$62.88
	06/01/2021	\$35.95	\$12.91	\$14.82	\$0.00	\$63.68
	08/01/2021	\$35.95	\$13.41	\$14.82	\$0.00	\$64.18
	12/01/2021	\$35.95	\$13.41	\$16.01	\$0.00	\$65.37
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2020	\$35.22	\$12.41	\$13.72	\$0.00	\$61.35
	08/01/2020	\$35.22	\$12.91	\$13.72	\$0.00	\$61.85
	12/01/2020	\$35.22	\$12.91	\$14.82	\$0.00	\$62.95
	06/01/2021	\$36.02	\$12.91	\$14.82	\$0.00	\$63.75
	08/01/2021	\$36.02	\$13.41	\$14.82	\$0.00	\$64.25
	12/01/2021	\$36.02	\$13.41	\$16.01	\$0.00	\$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2020	\$35.34	\$12.41	\$13.72	\$0.00	\$61.47
	08/01/2020	\$35.34	\$12.91	\$13.72	\$0.00	\$61.97
	12/01/2020	\$35.34	\$12.91	\$14.82	\$0.00	\$63.07
	06/01/2021	\$36.14	\$12.91	\$14.82	\$0.00	\$63.87
	08/01/2021	\$36.14	\$13.41	\$14.82	\$0.00	\$64.37
	12/01/2021	\$36.14	\$13.41	\$16.01	\$0.00	\$65.56
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.81	\$8.60	\$15.77	\$0.00	\$59.18
	12/01/2020	\$35.70	\$8.60	\$15.77	\$0.00	\$60.07
	06/01/2021	\$36.62	\$8.60	\$15.77	\$0.00	\$60.99
	12/01/2021	\$37.53	\$8.60	\$15.77	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	06/01/2020	\$38.00	\$12.50	\$8.85	\$0.00	\$59.35
	12/01/2020	\$39.00	\$12.50	\$8.85	\$0.00	\$60.35
ASPHALT RAKER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$49.33	\$13.00	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.48	\$13.00	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.58	\$13.00	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.73	\$13.00	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$49.33	\$13.00	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.48	\$13.00	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.58	\$13.00	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.73	\$13.00	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.81	\$8.60	\$15.77	\$0.00	\$59.18
	12/01/2020	\$35.70	\$8.60	\$15.77	\$0.00	\$60.07
	06/01/2021	\$36.62	\$8.60	\$15.77	\$0.00	\$60.99
	12/01/2021	\$37.53	\$8.60	\$15.77	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2020	\$46.10	\$7.07	\$17.98	\$0.00	\$71.15

Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
2	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
3	70	\$32.27	\$7.07	\$12.59	\$0.00	\$51.93
4	75	\$34.58	\$7.07	\$13.49	\$0.00	\$55.14
5	80	\$36.88	\$7.07	\$14.38	\$0.00	\$58.33
6	85	\$39.19	\$7.07	\$15.29	\$0.00	\$61.55
7	90	\$41.49	\$7.07	\$16.18	\$0.00	\$64.74
8	95	\$43.80	\$7.07	\$17.09	\$0.00	\$67.96

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 3 (LYNN)</i>	02/01/2020	\$54.40	\$10.75	\$21.94	\$0.00	\$87.09
	08/01/2020	\$55.75	\$10.75	\$22.09	\$0.00	\$88.59
	02/01/2021	\$56.39	\$10.75	\$22.09	\$0.00	\$89.23
	08/01/2021	\$57.79	\$10.75	\$22.25	\$0.00	\$90.79
	02/01/2022	\$58.38	\$10.75	\$22.25	\$0.00	\$91.38

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Lynn

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.20	\$10.75	\$21.94	\$0.00	\$59.89
2	60	\$32.64	\$10.75	\$21.94	\$0.00	\$65.33
3	70	\$38.08	\$10.75	\$21.94	\$0.00	\$70.77
4	80	\$43.52	\$10.75	\$21.94	\$0.00	\$76.21
5	90	\$48.96	\$10.75	\$21.94	\$0.00	\$81.65

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.88	\$10.75	\$22.09	\$0.00	\$60.72
2	60	\$33.45	\$10.75	\$22.09	\$0.00	\$66.29
3	70	\$39.03	\$10.75	\$22.09	\$0.00	\$71.87
4	80	\$44.60	\$10.75	\$22.09	\$0.00	\$77.44
5	90	\$50.18	\$10.75	\$22.09	\$0.00	\$83.02

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2020	\$40.30	\$8.60	\$17.24	\$0.00	\$66.14
	12/01/2020	\$41.28	\$8.60	\$17.24	\$0.00	\$67.12
	06/01/2021	\$42.30	\$8.60	\$17.24	\$0.00	\$68.14
	12/01/2021	\$43.31	\$8.60	\$17.24	\$0.00	\$69.15

For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2020	\$39.15	\$8.60	\$17.24	\$0.00	\$64.99
	12/01/2020	\$40.13	\$8.60	\$17.24	\$0.00	\$65.97
	06/01/2021	\$41.15	\$8.60	\$17.24	\$0.00	\$66.99
	12/01/2021	\$42.16	\$8.60	\$17.24	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2020	\$39.15	\$8.60	\$17.24	\$0.00	\$64.99
	12/01/2020	\$40.13	\$8.60	\$17.24	\$0.00	\$65.97
	06/01/2021	\$41.15	\$8.60	\$17.24	\$0.00	\$66.99
	12/01/2021	\$42.16	\$8.60	\$17.24	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARPENTER	03/01/2020	\$42.50	\$9.40	\$18.95	\$0.00	\$70.85
CARPENTERS -ZONE 2 (Eastern Massachusetts)	09/01/2020	\$43.15	\$9.40	\$18.95	\$0.00	\$71.50
	03/01/2021	\$43.75	\$9.40	\$18.95	\$0.00	\$72.10
	09/01/2021	\$44.40	\$9.40	\$18.95	\$0.00	\$72.75
	03/01/2022	\$45.00	\$9.40	\$18.95	\$0.00	\$73.35
	09/01/2022	\$45.65	\$9.40	\$18.95	\$0.00	\$74.00
	03/01/2023	\$46.25	\$9.40	\$18.95	\$0.00	\$74.60

Apprentice - CARPENTER - Zone 2 Eastern MA

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.25	\$9.40	\$1.73	\$0.00	\$32.38
2	60	\$25.50	\$9.40	\$1.73	\$0.00	\$36.63
3	70	\$29.75	\$9.40	\$13.76	\$0.00	\$52.91
4	75	\$31.88	\$9.40	\$13.76	\$0.00	\$55.04
5	80	\$34.00	\$9.40	\$15.49	\$0.00	\$58.89
6	80	\$34.00	\$9.40	\$15.49	\$0.00	\$58.89
7	90	\$38.25	\$9.40	\$17.22	\$0.00	\$64.87
8	90	\$38.25	\$9.40	\$17.22	\$0.00	\$64.87

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.58	\$9.40	\$1.73	\$0.00	\$32.71
2	60	\$25.89	\$9.40	\$1.73	\$0.00	\$37.02
3	70	\$30.21	\$9.40	\$13.76	\$0.00	\$53.37
4	75	\$32.36	\$9.40	\$13.76	\$0.00	\$55.52
5	80	\$34.52	\$9.40	\$15.49	\$0.00	\$59.41
6	80	\$34.52	\$9.40	\$15.49	\$0.00	\$59.41
7	90	\$38.84	\$9.40	\$17.22	\$0.00	\$65.46
8	90	\$38.84	\$9.40	\$17.22	\$0.00	\$65.46

Notes:
 % Indentured After 10/1/17; 45/45/55/55/70/70/80/80
 Step 1&2 \$30.26/ 3&4 \$36.18/ 5&6 \$54.64/ 7&8 \$60.62

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME	10/01/2019	\$27.95	\$7.07	\$7.86	\$0.00	\$42.88
CARPENTERS -ZONE 2 (Wood Frame)						

All Aspects of New Wood Frame Work

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - CARPENTER (Wood Frame) - Zone 2

Effective Date - 10/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$16.77	\$7.07	\$0.00	\$0.00	\$23.84
2	60	\$16.77	\$7.07	\$0.00	\$0.00	\$23.84
3	65	\$18.17	\$7.07	\$7.86	\$0.00	\$33.10
4	70	\$19.57	\$7.07	\$7.86	\$0.00	\$34.50
5	75	\$20.96	\$7.07	\$7.86	\$0.00	\$35.89
6	80	\$22.36	\$7.07	\$7.86	\$0.00	\$37.29
7	85	\$23.76	\$7.07	\$7.86	\$0.00	\$38.69
8	90	\$25.16	\$7.07	\$7.86	\$0.00	\$40.09

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 \$19.65/ 3&4 \$27.19/ 5&6 \$34.50/ 7&8 \$37.29

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3 (LYNN)	01/01/2020	\$49.07	\$12.75	\$22.41	\$0.62	\$84.85
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Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Lynn)

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.54	\$12.75	\$15.41	\$0.00	\$52.70
2	60	\$29.44	\$12.75	\$17.41	\$0.62	\$60.22
3	65	\$31.90	\$12.75	\$18.41	\$0.62	\$63.68
4	70	\$34.35	\$12.75	\$19.41	\$0.62	\$67.13
5	75	\$36.80	\$12.75	\$20.41	\$0.62	\$70.58
6	80	\$39.26	\$12.75	\$21.41	\$0.62	\$74.04
7	90	\$44.16	\$12.75	\$22.41	\$0.62	\$79.94

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR LABORERS - ZONE 2	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES OPERATING ENGINEERS LOCAL 4	06/01/2020	\$50.33	\$13.00	\$15.70	\$0.00	\$79.03
	12/01/2020	\$51.48	\$13.00	\$15.70	\$0.00	\$80.18
	06/01/2021	\$52.58	\$13.00	\$15.70	\$0.00	\$81.28
	12/01/2021	\$53.73	\$13.00	\$15.70	\$0.00	\$82.43

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
COMPRESSOR OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$32.72	\$13.00	\$15.70	\$0.00	\$61.42
	12/01/2020	\$33.50	\$13.00	\$15.70	\$0.00	\$62.20
	06/01/2021	\$34.25	\$13.00	\$15.70	\$0.00	\$62.95
	12/01/2021	\$35.04	\$13.00	\$15.70	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 2</i>	07/01/2020	\$51.51	\$8.25	\$22.40	\$0.00	\$82.16
	01/01/2021	\$52.06	\$8.25	\$22.75	\$0.00	\$83.06

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.76	\$8.25	\$0.00	\$0.00	\$34.01
2	55	\$28.33	\$8.25	\$6.05	\$0.00	\$42.63
3	60	\$30.91	\$8.25	\$6.60	\$0.00	\$45.76
4	65	\$33.48	\$8.25	\$7.15	\$0.00	\$48.88
5	70	\$36.06	\$8.25	\$19.10	\$0.00	\$63.41
6	75	\$38.63	\$8.25	\$19.65	\$0.00	\$66.53
7	80	\$41.21	\$8.25	\$20.20	\$0.00	\$69.66
8	90	\$46.36	\$8.25	\$21.30	\$0.00	\$75.91

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.03	\$8.25	\$0.00	\$0.00	\$34.28
2	55	\$28.63	\$8.25	\$6.16	\$0.00	\$43.04
3	60	\$31.24	\$8.25	\$6.72	\$0.00	\$46.21
4	65	\$33.84	\$8.25	\$7.28	\$0.00	\$49.37
5	70	\$36.44	\$8.25	\$19.39	\$0.00	\$64.08
6	75	\$39.05	\$8.25	\$19.95	\$0.00	\$67.25
7	80	\$41.65	\$8.25	\$20.51	\$0.00	\$70.41
8	90	\$46.85	\$8.25	\$21.63	\$0.00	\$76.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN <i>LABORERS - ZONE 2</i>	12/01/2019	\$39.30	\$8.10	\$16.60	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2019	\$40.30	\$8.10	\$16.60	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS <i>LABORERS - ZONE 2</i>	12/01/2019	\$40.05	\$8.10	\$16.60	\$0.00	\$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER <i>LABORERS - ZONE 2</i>	12/01/2019	\$40.30	\$8.10	\$16.60	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: JACKHAMMER OPERATOR <i>LABORERS - ZONE 2</i>	12/01/2019	\$40.05	\$8.10	\$16.60	\$0.00	\$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER <i>LABORERS - ZONE 2</i>	12/01/2019	\$39.30	\$8.10	\$16.60	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$68.52	\$9.90	\$21.15	\$0.00	\$99.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$73.41	\$9.90	\$21.15	\$0.00	\$104.46
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) <i>ELECTRICIANS LOCAL 103</i>	03/01/2020	\$53.50	\$13.00	\$19.20	\$0.00	\$85.70
	09/01/2020	\$54.93	\$13.00	\$19.25	\$0.00	\$87.18
	03/01/2021	\$56.13	\$13.00	\$19.28	\$0.00	\$88.41
	09/01/2021	\$57.56	\$13.00	\$19.33	\$0.00	\$89.89
	03/01/2022	\$58.76	\$13.00	\$19.36	\$0.00	\$91.12
	09/01/2022	\$60.19	\$13.00	\$19.41	\$0.00	\$92.60
	03/01/2023	\$61.39	\$13.00	\$19.44	\$0.00	\$93.83
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2020	\$53.50	\$13.00	\$19.20	\$0.00	\$85.70
	09/01/2020	\$54.93	\$13.00	\$19.25	\$0.00	\$87.18
	03/01/2021	\$56.13	\$13.00	\$19.28	\$0.00	\$88.41
	09/01/2021	\$57.56	\$13.00	\$19.33	\$0.00	\$89.89
	03/01/2022	\$58.76	\$13.00	\$19.36	\$0.00	\$91.12
	09/01/2022	\$60.19	\$13.00	\$19.41	\$0.00	\$92.60
	03/01/2023	\$61.39	\$13.00	\$19.44	\$0.00	\$93.83

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - ELECTRICIAN - Local 103

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.40	\$13.00	\$0.64	\$0.00	\$35.04
2	40	\$21.40	\$13.00	\$0.64	\$0.00	\$35.04
3	45	\$24.08	\$13.00	\$14.62	\$0.00	\$51.70
4	45	\$24.08	\$13.00	\$14.62	\$0.00	\$51.70
5	50	\$26.75	\$13.00	\$15.04	\$0.00	\$54.79
6	55	\$29.43	\$13.00	\$15.46	\$0.00	\$57.89
7	60	\$32.10	\$13.00	\$15.87	\$0.00	\$60.97
8	65	\$34.78	\$13.00	\$16.29	\$0.00	\$64.07
9	70	\$37.45	\$13.00	\$16.70	\$0.00	\$67.15
10	75	\$40.13	\$13.00	\$17.12	\$0.00	\$70.25

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.97	\$13.00	\$0.66	\$0.00	\$35.63
2	40	\$21.97	\$13.00	\$0.66	\$0.00	\$35.63
3	45	\$24.72	\$13.00	\$14.64	\$0.00	\$52.36
4	45	\$24.72	\$13.00	\$14.64	\$0.00	\$52.36
5	50	\$27.47	\$13.00	\$15.06	\$0.00	\$55.53
6	55	\$30.21	\$13.00	\$15.49	\$0.00	\$58.70
7	60	\$32.96	\$13.00	\$15.90	\$0.00	\$61.86
8	65	\$35.70	\$13.00	\$16.32	\$0.00	\$65.02
9	70	\$38.45	\$13.00	\$16.73	\$0.00	\$68.18
10	75	\$41.20	\$13.00	\$17.16	\$0.00	\$71.36

Notes :
 App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR	01/01/2020	\$61.42	\$15.73	\$18.41	\$0.00	\$95.56
ELEVATOR CONSTRUCTORS LOCAL 4	01/01/2021	\$63.47	\$15.88	\$19.31	\$0.00	\$98.66
	01/01/2022	\$65.62	\$16.03	\$20.21	\$0.00	\$101.86

Apprentice - ELEVATOR CONSTRUCTOR - Local 4

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$30.71	\$15.73	\$0.00	\$0.00	\$46.44
2	55	\$33.78	\$15.73	\$18.41	\$0.00	\$67.92
3	65	\$39.92	\$15.73	\$18.41	\$0.00	\$74.06
4	70	\$42.99	\$15.73	\$18.41	\$0.00	\$77.13
5	80	\$49.14	\$15.73	\$18.41	\$0.00	\$83.28

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.74	\$15.88	\$0.00	\$0.00	\$47.62
2	55	\$34.91	\$15.88	\$19.31	\$0.00	\$70.10
3	65	\$41.26	\$15.88	\$19.31	\$0.00	\$76.45
4	70	\$44.43	\$15.88	\$19.31	\$0.00	\$79.62
5	80	\$50.78	\$15.88	\$19.31	\$0.00	\$85.97

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2020	\$42.99	\$15.73	\$18.41	\$0.00	\$77.13
	01/01/2021	\$44.43	\$15.88	\$19.31	\$0.00	\$79.62
	01/01/2022	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2020	\$44.73	\$12.50	\$15.70	\$0.00	\$72.93
	11/01/2020	\$45.73	\$12.50	\$15.70	\$0.00	\$73.93
	05/01/2021	\$46.88	\$12.50	\$15.70	\$0.00	\$75.08
	11/01/2021	\$47.88	\$12.50	\$15.70	\$0.00	\$76.08
	05/01/2022	\$49.03	\$12.50	\$15.70	\$0.00	\$77.23

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2020	\$46.23	\$12.50	\$15.70	\$0.00	\$74.43
	11/01/2020	\$47.24	\$12.50	\$15.70	\$0.00	\$75.44
	05/01/2021	\$48.40	\$12.50	\$15.70	\$0.00	\$76.60
	11/01/2021	\$49.41	\$12.50	\$15.70	\$0.00	\$77.61
	05/01/2022	\$50.57	\$12.50	\$15.70	\$0.00	\$78.77

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2020	\$22.64	\$12.50	\$15.70	\$0.00	\$50.84
	11/01/2020	\$23.23	\$12.50	\$15.70	\$0.00	\$51.43
	05/01/2021	\$23.91	\$12.50	\$15.70	\$0.00	\$52.11
	11/01/2021	\$24.51	\$12.50	\$15.70	\$0.00	\$52.71
	05/01/2022	\$25.18	\$12.50	\$15.70	\$0.00	\$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	03/01/2020	\$53.50	\$13.00	\$19.20	\$0.00	\$85.70
	09/01/2020	\$54.93	\$13.00	\$19.25	\$0.00	\$87.18
	03/01/2021	\$56.13	\$13.00	\$19.28	\$0.00	\$88.41
	09/01/2021	\$57.56	\$13.00	\$19.33	\$0.00	\$89.89
	03/01/2022	\$58.76	\$13.00	\$19.36	\$0.00	\$91.12
	09/01/2022	\$60.19	\$13.00	\$19.41	\$0.00	\$92.60
	03/01/2023	\$61.39	\$13.00	\$19.44	\$0.00	\$93.83
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE <i>LOCAL 103</i> / COMMISSIONING <i>ELECTRICIANS</i>	03/01/2020	\$40.13	\$13.00	\$17.12	\$0.00	\$70.25
	09/01/2020	\$41.20	\$13.00	\$17.16	\$0.00	\$71.36
	03/01/2021	\$42.66	\$13.00	\$17.27	\$0.00	\$72.93
	09/01/2021	\$44.32	\$13.00	\$17.38	\$0.00	\$74.70
	03/01/2022	\$45.83	\$13.00	\$17.49	\$0.00	\$76.32
	09/01/2022	\$47.55	\$13.00	\$17.62	\$0.00	\$78.17
	03/01/2023	\$49.11	\$13.00	\$17.73	\$0.00	\$79.84
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$40.30	\$13.00	\$15.70	\$0.00	\$69.00
	12/01/2020	\$41.25	\$13.00	\$15.70	\$0.00	\$69.95
	06/01/2021	\$42.16	\$13.00	\$15.70	\$0.00	\$70.86
	12/01/2021	\$43.11	\$13.00	\$15.70	\$0.00	\$71.81
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER <i>LABORERS - ZONE 2</i>	06/01/2020	\$23.50	\$8.60	\$15.77	\$0.00	\$47.87
	12/01/2020	\$24.50	\$8.60	\$15.77	\$0.00	\$48.87
	06/01/2021	\$24.50	\$8.60	\$15.77	\$0.00	\$48.87
	12/01/2021	\$24.50	\$8.60	\$15.77	\$0.00	\$48.87
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE 1</i>	03/01/2020	\$47.05	\$9.40	\$19.25	\$0.00	\$75.70
	09/01/2020	\$47.85	\$9.40	\$19.25	\$0.00	\$76.50
	03/01/2021	\$48.65	\$9.40	\$19.25	\$0.00	\$77.30
	09/01/2021	\$49.45	\$9.40	\$19.25	\$0.00	\$78.10
	03/01/2022	\$50.25	\$9.40	\$19.25	\$0.00	\$78.90

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - FLOORCOVERER - Local 2168 Zone I

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.53	\$9.40	\$1.79	\$0.00	\$34.72
2	55	\$25.88	\$9.40	\$1.79	\$0.00	\$37.07
3	60	\$28.23	\$9.40	\$13.88	\$0.00	\$51.51
4	65	\$30.58	\$9.40	\$13.88	\$0.00	\$53.86
5	70	\$32.94	\$9.40	\$15.67	\$0.00	\$58.01
6	75	\$35.29	\$9.40	\$15.67	\$0.00	\$60.36
7	80	\$37.64	\$9.40	\$17.46	\$0.00	\$64.50
8	85	\$39.99	\$9.40	\$17.46	\$0.00	\$66.85

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.93	\$9.40	\$1.79	\$0.00	\$35.12
2	55	\$26.32	\$9.40	\$1.79	\$0.00	\$37.51
3	60	\$28.71	\$9.40	\$13.88	\$0.00	\$51.99
4	65	\$31.10	\$9.40	\$13.88	\$0.00	\$54.38
5	70	\$33.50	\$9.40	\$15.67	\$0.00	\$58.57
6	75	\$35.89	\$9.40	\$15.67	\$0.00	\$60.96
7	80	\$38.28	\$9.40	\$17.46	\$0.00	\$65.14
8	85	\$40.67	\$9.40	\$17.46	\$0.00	\$67.53

Notes: Steps are 750 hrs.
 % After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
 Step 1&2 \$32.36/ 3&4 \$38.80/ 5&6 \$58.01/ 7&8 \$64.50

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER	06/01/2020	\$49.33	\$13.00	\$15.70	\$0.00	\$78.03
<i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$50.48	\$13.00	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.58	\$13.00	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.73	\$13.00	\$15.70	\$0.00	\$81.43

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GENERATOR/LIGHTING PLANT/HEATERS	06/01/2020	\$32.72	\$13.00	\$15.70	\$0.00	\$61.42
<i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$33.50	\$13.00	\$15.70	\$0.00	\$62.20
	06/01/2021	\$34.25	\$13.00	\$15.70	\$0.00	\$62.95
	12/01/2021	\$35.04	\$13.00	\$15.70	\$0.00	\$63.74

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)	07/01/2020	\$41.01	\$8.25	\$22.40	\$0.00	\$71.66
<i>GLAZIERS LOCAL 35 (ZONE 2)</i>	01/01/2021	\$41.56	\$8.25	\$22.75	\$0.00	\$72.56

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - GLAZIER - Local 35 Zone 2

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.51	\$8.25	\$0.00	\$0.00	\$28.76
2	55	\$22.56	\$8.25	\$6.05	\$0.00	\$36.86
3	60	\$24.61	\$8.25	\$6.60	\$0.00	\$39.46
4	65	\$26.66	\$8.25	\$7.15	\$0.00	\$42.06
5	70	\$28.71	\$8.25	\$19.10	\$0.00	\$56.06
6	75	\$30.76	\$8.25	\$19.65	\$0.00	\$58.66
7	80	\$32.81	\$8.25	\$20.20	\$0.00	\$61.26
8	90	\$36.91	\$8.25	\$21.30	\$0.00	\$66.46

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.78	\$8.25	\$0.00	\$0.00	\$29.03
2	55	\$22.86	\$8.25	\$6.16	\$0.00	\$37.27
3	60	\$24.94	\$8.25	\$6.72	\$0.00	\$39.91
4	65	\$27.01	\$8.25	\$7.28	\$0.00	\$42.54
5	70	\$29.09	\$8.25	\$19.39	\$0.00	\$56.73
6	75	\$31.17	\$8.25	\$19.95	\$0.00	\$59.37
7	80	\$33.25	\$8.25	\$20.51	\$0.00	\$62.01
8	90	\$37.40	\$8.25	\$21.63	\$0.00	\$67.28

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS	06/01/2020	\$49.33	\$13.00	\$15.70	\$0.00	\$78.03
OPERATING ENGINEERS LOCAL 4	12/01/2020	\$50.48	\$13.00	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.58	\$13.00	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.73	\$13.00	\$15.70	\$0.00	\$81.43

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - OPERATING ENGINEERS - Local 4

Effective Date - 06/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$27.13	\$13.00	\$0.00	\$0.00	\$40.13
2	60	\$29.60	\$13.00	\$15.70	\$0.00	\$58.30
3	65	\$32.06	\$13.00	\$15.70	\$0.00	\$60.76
4	70	\$34.53	\$13.00	\$15.70	\$0.00	\$63.23
5	75	\$37.00	\$13.00	\$15.70	\$0.00	\$65.70
6	80	\$39.46	\$13.00	\$15.70	\$0.00	\$68.16
7	85	\$41.93	\$13.00	\$15.70	\$0.00	\$70.63
8	90	\$44.40	\$13.00	\$15.70	\$0.00	\$73.10

Effective Date - 12/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$27.76	\$13.00	\$0.00	\$0.00	\$40.76
2	60	\$30.29	\$13.00	\$15.70	\$0.00	\$58.99
3	65	\$32.81	\$13.00	\$15.70	\$0.00	\$61.51
4	70	\$35.34	\$13.00	\$15.70	\$0.00	\$64.04
5	75	\$37.86	\$13.00	\$15.70	\$0.00	\$66.56
6	80	\$40.38	\$13.00	\$15.70	\$0.00	\$69.08
7	85	\$42.91	\$13.00	\$15.70	\$0.00	\$71.61
8	90	\$45.43	\$13.00	\$15.70	\$0.00	\$74.13

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 - A	02/01/2020	\$49.36	\$13.35	\$24.12	\$2.61	\$89.44
	08/01/2020	\$50.67	\$13.50	\$24.12	\$2.65	\$90.94
	02/01/2021	\$52.32	\$13.50	\$24.12	\$2.70	\$92.64
	08/01/2021	\$54.07	\$13.50	\$24.12	\$2.75	\$94.44
	02/01/2022	\$55.82	\$13.50	\$24.12	\$2.80	\$96.24

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103	03/01/2020	\$53.50	\$13.00	\$19.20	\$0.00	\$85.70
	09/01/2020	\$54.93	\$13.00	\$19.25	\$0.00	\$87.18
	03/01/2021	\$56.13	\$13.00	\$19.28	\$0.00	\$88.41
	09/01/2021	\$57.56	\$13.00	\$19.33	\$0.00	\$89.89
	03/01/2022	\$58.76	\$13.00	\$19.36	\$0.00	\$91.12
	09/01/2022	\$60.19	\$13.00	\$19.41	\$0.00	\$92.60
	03/01/2023	\$61.39	\$13.00	\$19.44	\$0.00	\$93.83

For apprentice rates see "Apprentice- ELECTRICIAN"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2020	\$49.36	\$13.35	\$24.12	\$2.61	\$89.44
	08/01/2020	\$50.67	\$13.50	\$24.12	\$2.65	\$90.94
	02/01/2021	\$52.32	\$13.50	\$24.12	\$2.70	\$92.64
	08/01/2021	\$54.07	\$13.50	\$24.12	\$2.75	\$94.44
	02/01/2022	\$55.82	\$13.50	\$24.12	\$2.80	\$96.24
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	03/01/2020	\$51.86	\$10.95	\$19.74	\$0.00	\$82.55
	09/01/2020	\$53.36	\$10.95	\$19.74	\$0.00	\$84.05
	03/01/2021	\$54.86	\$10.95	\$19.74	\$0.00	\$85.55
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	03/01/2020	\$51.86	\$10.95	\$19.74	\$0.00	\$82.55
	09/01/2020	\$53.36	\$10.95	\$19.74	\$0.00	\$84.05
	03/01/2021	\$54.86	\$10.95	\$19.74	\$0.00	\$85.55
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.81	\$8.60	\$15.77	\$0.00	\$59.18
	12/01/2020	\$35.70	\$8.60	\$15.77	\$0.00	\$60.07
	06/01/2021	\$36.62	\$8.60	\$15.77	\$0.00	\$60.99
	12/01/2021	\$37.53	\$8.60	\$15.77	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2019	\$48.44	\$12.80	\$16.40	\$0.00	\$77.64

Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.22	\$12.80	\$11.90	\$0.00	\$48.92
2	60	\$29.06	\$12.80	\$12.80	\$0.00	\$54.66
3	70	\$33.91	\$12.80	\$13.70	\$0.00	\$60.41
4	80	\$38.75	\$12.80	\$14.60	\$0.00	\$66.15

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER <i>IRONWORKERS LOCAL 7 (BOSTON AREA)</i>	03/16/2019	\$46.66	\$8.00	\$23.50	\$0.00	\$78.16
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Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - IRONWORKER - Local 7 Boston

Effective Date - 03/16/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$28.00	\$8.00	\$23.50	\$0.00	\$59.50
2	70	\$32.66	\$8.00	\$23.50	\$0.00	\$64.16
3	75	\$35.00	\$8.00	\$23.50	\$0.00	\$66.50
4	80	\$37.33	\$8.00	\$23.50	\$0.00	\$68.83
5	85	\$39.66	\$8.00	\$23.50	\$0.00	\$71.16
6	90	\$41.99	\$8.00	\$23.50	\$0.00	\$73.49

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS - ZONE 2	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS - ZONE 2	06/01/2020	\$34.06	\$8.60	\$15.77	\$0.00	\$58.43
	12/01/2020	\$34.95	\$8.60	\$15.77	\$0.00	\$59.32
	06/01/2021	\$35.87	\$8.60	\$15.77	\$0.00	\$60.24
	12/01/2021	\$36.78	\$8.60	\$15.77	\$0.00	\$61.15

Apprentice - LABORER - Zone 2

Effective Date - 06/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$20.44	\$8.60	\$15.77	\$0.00	\$44.81
2	70	\$23.84	\$8.60	\$15.77	\$0.00	\$48.21
3	80	\$27.25	\$8.60	\$15.77	\$0.00	\$51.62
4	90	\$30.65	\$8.60	\$15.77	\$0.00	\$55.02

Effective Date - 12/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$20.97	\$8.60	\$15.77	\$0.00	\$45.34
2	70	\$24.47	\$8.60	\$15.77	\$0.00	\$48.84
3	80	\$27.96	\$8.60	\$15.77	\$0.00	\$52.33
4	90	\$31.46	\$8.60	\$15.77	\$0.00	\$55.83

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.06	\$8.60	\$15.77	\$0.00	\$58.43
	12/01/2020	\$34.95	\$8.60	\$15.77	\$0.00	\$59.32
	06/01/2021	\$35.87	\$8.60	\$15.77	\$0.00	\$60.24
	12/01/2021	\$36.78	\$8.60	\$15.77	\$0.00	\$61.15
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.06	\$8.60	\$15.77	\$0.00	\$58.43
	12/01/2020	\$34.95	\$8.60	\$15.77	\$0.00	\$59.32
	06/01/2021	\$35.87	\$8.60	\$15.77	\$0.00	\$60.24
	12/01/2021	\$36.78	\$8.60	\$15.77	\$0.00	\$61.15
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.15	\$8.60	\$15.83	\$0.00	\$58.58
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.06	\$8.60	\$15.77	\$0.00	\$58.43
	12/01/2020	\$34.95	\$8.60	\$15.77	\$0.00	\$59.32
	06/01/2021	\$35.87	\$8.60	\$15.77	\$0.00	\$60.24
	12/01/2021	\$36.78	\$8.60	\$15.77	\$0.00	\$61.15
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.06	\$8.60	\$15.77	\$0.00	\$58.43
	12/01/2020	\$34.95	\$8.60	\$15.77	\$0.00	\$59.32
	06/01/2021	\$35.87	\$8.60	\$15.77	\$0.00	\$60.24
	12/01/2021	\$36.78	\$8.60	\$15.77	\$0.00	\$61.15
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2020	\$41.49	\$10.75	\$20.12	\$0.00	\$72.36
	08/01/2020	\$42.57	\$10.75	\$20.27	\$0.00	\$73.59
	02/01/2021	\$43.08	\$10.75	\$20.27	\$0.00	\$74.10
	08/01/2021	\$44.20	\$10.75	\$20.43	\$0.00	\$75.38
	02/01/2022	\$44.67	\$10.75	\$20.43	\$0.00	\$75.85

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.75	\$10.75	\$20.12	\$0.00	\$51.62
2	60	\$24.89	\$10.75	\$20.12	\$0.00	\$55.76
3	70	\$29.04	\$10.75	\$20.12	\$0.00	\$59.91
4	80	\$33.19	\$10.75	\$20.12	\$0.00	\$64.06
5	90	\$37.34	\$10.75	\$20.12	\$0.00	\$68.21

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.29	\$10.75	\$20.27	\$0.00	\$52.31
2	60	\$25.54	\$10.75	\$20.27	\$0.00	\$56.56
3	70	\$29.80	\$10.75	\$20.27	\$0.00	\$60.82
4	80	\$34.06	\$10.75	\$20.27	\$0.00	\$65.08
5	90	\$38.31	\$10.75	\$20.27	\$0.00	\$69.33

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS, TILELAYERS & TERRAZZO MECH	02/01/2020	\$54.42	\$10.75	\$21.93	\$0.00	\$87.10
BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2020	\$55.77	\$10.75	\$22.08	\$0.00	\$88.60
	02/01/2021	\$56.41	\$10.75	\$22.08	\$0.00	\$89.24
	08/01/2021	\$57.81	\$10.75	\$22.24	\$0.00	\$90.80
	02/01/2022	\$58.38	\$10.75	\$22.24	\$0.00	\$91.37

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.21	\$10.75	\$21.93	\$0.00	\$59.89
2	60	\$32.65	\$10.75	\$21.93	\$0.00	\$65.33
3	70	\$38.09	\$10.75	\$21.93	\$0.00	\$70.77
4	80	\$43.54	\$10.75	\$21.93	\$0.00	\$76.22
5	90	\$48.98	\$10.75	\$21.93	\$0.00	\$81.66

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.89	\$10.75	\$22.08	\$0.00	\$60.72
2	60	\$33.46	\$10.75	\$22.08	\$0.00	\$66.29
3	70	\$39.04	\$10.75	\$22.08	\$0.00	\$71.87
4	80	\$44.62	\$10.75	\$22.08	\$0.00	\$77.45
5	90	\$50.19	\$10.75	\$22.08	\$0.00	\$83.02

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANICS MAINTENANCE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MILLWRIGHT (Zone 1) <i>MILLWRIGHTS LOCAL 1121 - Zone 1</i>	04/01/2019	\$42.22	\$9.90	\$18.50	\$0.00	\$70.62
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Apprentice - MILLWRIGHT - Local 1121 Zone 1

Effective Date - 04/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$23.22	\$9.90	\$5.31	\$0.00	\$38.43
2	65	\$27.44	\$9.90	\$15.13	\$0.00	\$52.47
3	75	\$31.67	\$9.90	\$16.10	\$0.00	\$57.67
4	85	\$35.89	\$9.90	\$17.06	\$0.00	\$62.85

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

OILER (OTHER THAN TRUCK CRANES,GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$23.13	\$13.00	\$15.70	\$0.00	\$51.83
	12/01/2020	\$23.70	\$13.00	\$15.70	\$0.00	\$52.40
	06/01/2021	\$24.25	\$13.00	\$15.70	\$0.00	\$52.95
	12/01/2021	\$24.83	\$13.00	\$15.70	\$0.00	\$53.53

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OILER (TRUCK CRANES, GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$27.79	\$13.00	\$15.70	\$0.00	\$56.49
	12/01/2020	\$28.47	\$13.00	\$15.70	\$0.00	\$57.17
	06/01/2021	\$29.11	\$13.00	\$15.70	\$0.00	\$57.81
	12/01/2021	\$29.79	\$13.00	\$15.70	\$0.00	\$58.49

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OTHER POWER DRIVEN EQUIPMENT - CLASS II <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

PAINTER (BRIDGES/TANKS) <i>PAINTERS LOCAL 35 - ZONE 2</i>	07/01/2020	\$51.51	\$8.25	\$22.40	\$0.00	\$82.16
	01/01/2021	\$52.06	\$8.25	\$22.75	\$0.00	\$83.06

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.76	\$8.25	\$0.00	\$0.00	\$34.01
2	55	\$28.33	\$8.25	\$6.05	\$0.00	\$42.63
3	60	\$30.91	\$8.25	\$6.60	\$0.00	\$45.76
4	65	\$33.48	\$8.25	\$7.15	\$0.00	\$48.88
5	70	\$36.06	\$8.25	\$19.10	\$0.00	\$63.41
6	75	\$38.63	\$8.25	\$19.65	\$0.00	\$66.53
7	80	\$41.21	\$8.25	\$20.20	\$0.00	\$69.66
8	90	\$46.36	\$8.25	\$21.30	\$0.00	\$75.91

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.03	\$8.25	\$0.00	\$0.00	\$34.28
2	55	\$28.63	\$8.25	\$6.16	\$0.00	\$43.04
3	60	\$31.24	\$8.25	\$6.72	\$0.00	\$46.21
4	65	\$33.84	\$8.25	\$7.28	\$0.00	\$49.37
5	70	\$36.44	\$8.25	\$19.39	\$0.00	\$64.08
6	75	\$39.05	\$8.25	\$19.95	\$0.00	\$67.25
7	80	\$41.65	\$8.25	\$20.51	\$0.00	\$70.41
8	90	\$46.85	\$8.25	\$21.63	\$0.00	\$76.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2020	\$41.21	\$8.25	\$22.40	\$0.00	\$71.86
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2	01/01/2021	\$42.96	\$8.25	\$22.75	\$0.00	\$73.96

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.61	\$8.25	\$0.00	\$0.00	\$28.86
2	55	\$22.67	\$8.25	\$6.05	\$0.00	\$36.97
3	60	\$24.73	\$8.25	\$6.60	\$0.00	\$39.58
4	65	\$26.79	\$8.25	\$7.15	\$0.00	\$42.19
5	70	\$28.85	\$8.25	\$19.10	\$0.00	\$56.20
6	75	\$30.91	\$8.25	\$19.65	\$0.00	\$58.81
7	80	\$32.97	\$8.25	\$20.20	\$0.00	\$61.42
8	90	\$37.09	\$8.25	\$21.30	\$0.00	\$66.64

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.48	\$8.25	\$0.00	\$0.00	\$29.73
2	55	\$23.63	\$8.25	\$6.16	\$0.00	\$38.04
3	60	\$25.78	\$8.25	\$6.72	\$0.00	\$40.75
4	65	\$27.92	\$8.25	\$7.28	\$0.00	\$43.45
5	70	\$30.07	\$8.25	\$19.39	\$0.00	\$57.71
6	75	\$32.22	\$8.25	\$19.95	\$0.00	\$60.42
7	80	\$34.37	\$8.25	\$20.51	\$0.00	\$63.13
8	90	\$38.66	\$8.25	\$21.63	\$0.00	\$68.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	07/01/2020	\$40.47	\$8.25	\$22.40	\$0.00	\$71.12
PAINTERS LOCAL 35 - ZONE 2	01/01/2021	\$41.02	\$8.25	\$22.75	\$0.00	\$72.02

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.24	\$8.25	\$0.00	\$0.00	\$28.49
2	55	\$22.26	\$8.25	\$6.05	\$0.00	\$36.56
3	60	\$24.28	\$8.25	\$6.60	\$0.00	\$39.13
4	65	\$26.31	\$8.25	\$7.15	\$0.00	\$41.71
5	70	\$28.33	\$8.25	\$19.10	\$0.00	\$55.68
6	75	\$30.35	\$8.25	\$19.65	\$0.00	\$58.25
7	80	\$32.38	\$8.25	\$20.20	\$0.00	\$60.83
8	90	\$36.42	\$8.25	\$21.30	\$0.00	\$65.97

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.51	\$8.25	\$0.00	\$0.00	\$28.76
2	55	\$22.56	\$8.25	\$6.16	\$0.00	\$36.97
3	60	\$24.61	\$8.25	\$6.72	\$0.00	\$39.58
4	65	\$26.66	\$8.25	\$7.28	\$0.00	\$42.19
5	70	\$28.71	\$8.25	\$19.39	\$0.00	\$56.35
6	75	\$30.77	\$8.25	\$19.95	\$0.00	\$58.97
7	80	\$32.82	\$8.25	\$20.51	\$0.00	\$61.58
8	90	\$36.92	\$8.25	\$21.63	\$0.00	\$66.80

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) LABORERS - ZONE 2	06/01/2020	\$34.06	\$8.60	\$15.77	\$0.00	\$58.43
	12/01/2020	\$34.95	\$8.60	\$15.77	\$0.00	\$59.32
	06/01/2021	\$35.87	\$8.60	\$15.77	\$0.00	\$60.24
	12/01/2021	\$36.78	\$8.60	\$15.77	\$0.00	\$61.15

For Apprentice rates see "Apprentice- LABORER"

PAINTER / TAPER (BRUSH, NEW) *	07/01/2020	\$41.01	\$8.25	\$22.40	\$0.00	\$71.66
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2	01/01/2021	\$41.56	\$8.25	\$22.75	\$0.00	\$72.56

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.51	\$8.25	\$0.00	\$0.00	\$28.76
2	55	\$22.56	\$8.25	\$6.05	\$0.00	\$36.86
3	60	\$24.61	\$8.25	\$6.60	\$0.00	\$39.46
4	65	\$26.66	\$8.25	\$7.15	\$0.00	\$42.06
5	70	\$28.71	\$8.25	\$19.10	\$0.00	\$56.06
6	75	\$30.76	\$8.25	\$19.65	\$0.00	\$58.66
7	80	\$32.81	\$8.25	\$20.20	\$0.00	\$61.26
8	90	\$36.91	\$8.25	\$21.30	\$0.00	\$66.46

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.78	\$8.25	\$0.00	\$0.00	\$29.03
2	55	\$22.86	\$8.25	\$6.16	\$0.00	\$37.27
3	60	\$24.94	\$8.25	\$6.72	\$0.00	\$39.91
4	65	\$27.01	\$8.25	\$7.28	\$0.00	\$42.54
5	70	\$29.09	\$8.25	\$19.39	\$0.00	\$56.73
6	75	\$31.17	\$8.25	\$19.95	\$0.00	\$59.37
7	80	\$33.25	\$8.25	\$20.51	\$0.00	\$62.01
8	90	\$37.40	\$8.25	\$21.63	\$0.00	\$67.28

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)	07/01/2020	\$39.07	\$8.25	\$22.40	\$0.00	\$69.72
PAINTERS LOCAL 35 - ZONE 2	01/01/2021	\$39.62	\$8.25	\$22.75	\$0.00	\$70.62

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.54	\$8.25	\$0.00	\$0.00	\$27.79
2	55	\$21.49	\$8.25	\$6.05	\$0.00	\$35.79
3	60	\$23.44	\$8.25	\$6.60	\$0.00	\$38.29
4	65	\$25.40	\$8.25	\$7.15	\$0.00	\$40.80
5	70	\$27.35	\$8.25	\$19.10	\$0.00	\$54.70
6	75	\$29.30	\$8.25	\$19.65	\$0.00	\$57.20
7	80	\$31.26	\$8.25	\$20.20	\$0.00	\$59.71
8	90	\$35.16	\$8.25	\$21.30	\$0.00	\$64.71

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.81	\$8.25	\$0.00	\$0.00	\$28.06
2	55	\$21.79	\$8.25	\$6.16	\$0.00	\$36.20
3	60	\$23.77	\$8.25	\$6.72	\$0.00	\$38.74
4	65	\$25.75	\$8.25	\$7.28	\$0.00	\$41.28
5	70	\$27.73	\$8.25	\$19.39	\$0.00	\$55.37
6	75	\$29.72	\$8.25	\$19.95	\$0.00	\$57.92
7	80	\$31.70	\$8.25	\$20.51	\$0.00	\$60.46
8	90	\$35.66	\$8.25	\$21.63	\$0.00	\$65.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2020	\$34.98	\$12.41	\$13.72	\$0.00	\$61.11
	08/01/2020	\$34.98	\$12.91	\$13.72	\$0.00	\$61.61
	12/01/2020	\$34.98	\$12.91	\$14.82	\$0.00	\$62.71
	06/01/2021	\$35.78	\$12.91	\$14.82	\$0.00	\$63.51
	08/01/2021	\$35.78	\$13.41	\$14.82	\$0.00	\$64.01
	12/01/2021	\$35.78	\$13.41	\$16.01	\$0.00	\$65.20
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i> For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
PILE DRIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99

Apprentice - PILE DRIVER - Local 56 Zone 1

Effective Date - 08/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.47	\$9.90	\$21.15	\$0.00	\$55.52
2	60	\$29.36	\$9.90	\$21.15	\$0.00	\$60.41
3	70	\$34.26	\$9.90	\$21.15	\$0.00	\$65.31
4	75	\$36.71	\$9.90	\$21.15	\$0.00	\$67.76
5	80	\$39.15	\$9.90	\$21.15	\$0.00	\$70.20
6	80	\$39.15	\$9.90	\$21.15	\$0.00	\$70.20
7	90	\$44.05	\$9.90	\$21.15	\$0.00	\$75.10
8	90	\$44.05	\$9.90	\$21.15	\$0.00	\$75.10

Notes:

Apprentice to Journeyworker Ratio:1:5

PIPEFITTER & STEAMFITTER	03/01/2020	\$51.86	\$10.95	\$19.74	\$0.00	\$82.55
PIPEFITTERS LOCAL 537 (Local 138)	09/01/2020	\$53.36	\$10.95	\$19.74	\$0.00	\$84.05
	03/01/2021	\$54.86	\$10.95	\$19.74	\$0.00	\$85.55

Apprentice - PIPEFITTER Local 537 (Local 138)

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$20.74	\$10.95	\$8.00	\$0.00	\$39.69
2	45	\$23.34	\$10.95	\$19.74	\$0.00	\$54.03
3	60	\$31.12	\$10.95	\$19.74	\$0.00	\$61.81
4	70	\$36.30	\$10.95	\$19.74	\$0.00	\$66.99
5	80	\$41.49	\$10.95	\$19.74	\$0.00	\$72.18

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.34	\$10.95	\$8.00	\$0.00	\$40.29
2	45	\$24.01	\$10.95	\$19.74	\$0.00	\$54.70
3	60	\$32.02	\$10.95	\$19.74	\$0.00	\$62.71
4	70	\$37.35	\$10.95	\$19.74	\$0.00	\$68.04
5	80	\$42.69	\$10.95	\$19.74	\$0.00	\$73.38

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

PLUMBER <i>PLUMBERS & GASFITTERS LOCAL 12 (Local 138)</i>	03/01/2020	\$54.61	\$12.07	\$17.26	\$0.00	\$83.94
	09/01/2020	\$56.11	\$12.07	\$17.26	\$0.00	\$85.44
	03/01/2021	\$57.61	\$12.07	\$17.26	\$0.00	\$86.94

Apprentice - PLUMBER/GASFITTER - Local 12 (Local 138)

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$19.11	\$12.07	\$6.24	\$0.00	\$37.42
2	40	\$21.84	\$12.07	\$7.08	\$0.00	\$40.99
3	55	\$30.04	\$12.07	\$9.63	\$0.00	\$51.74
4	65	\$35.50	\$12.07	\$11.33	\$0.00	\$58.90
5	75	\$40.96	\$12.07	\$13.03	\$0.00	\$66.06

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$19.64	\$12.07	\$6.24	\$0.00	\$37.95
2	40	\$22.44	\$12.07	\$7.08	\$0.00	\$41.59
3	55	\$30.86	\$12.07	\$9.63	\$0.00	\$52.56
4	65	\$36.47	\$12.07	\$11.33	\$0.00	\$59.87
5	75	\$42.08	\$12.07	\$13.03	\$0.00	\$67.18

Notes:

Steps are 1 yr
Step 4 with lic\$62.47, Step5 with lic\$69.63

Apprentice to Journeyworker Ratio:1:5

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537 (Local 138)</i>	03/01/2020	\$51.86	\$10.95	\$19.74	\$0.00	\$82.55
	09/01/2020	\$53.36	\$10.95	\$19.74	\$0.00	\$84.05
	03/01/2021	\$54.86	\$10.95	\$19.74	\$0.00	\$85.55

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

PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

POWDERMAN & BLASTER <i>LABORERS - ZONE 2</i>	06/01/2020	\$35.06	\$8.60	\$15.77	\$0.00	\$59.43
	12/01/2020	\$35.95	\$8.60	\$15.77	\$0.00	\$60.32
	06/01/2021	\$36.87	\$8.60	\$15.77	\$0.00	\$61.24
	12/01/2021	\$37.78	\$8.60	\$15.77	\$0.00	\$62.15

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$49.33	\$13.00	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.48	\$13.00	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.58	\$13.00	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.73	\$13.00	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$49.33	\$13.00	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.48	\$13.00	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.58	\$13.00	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.73	\$13.00	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$32.72	\$13.00	\$15.70	\$0.00	\$61.42
	12/01/2020	\$33.50	\$13.00	\$15.70	\$0.00	\$62.20
	06/01/2021	\$34.25	\$13.00	\$15.70	\$0.00	\$62.95
	12/01/2021	\$35.04	\$13.00	\$15.70	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER <i>TEAMSTERS 42 - J.G. MacLeallan (Wakefield)</i>	05/01/2020	\$26.65	\$7.99	\$7.00	\$0.00	\$41.64
	05/01/2021	\$27.00	\$7.99	\$7.00	\$0.00	\$41.99
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofing &Roofer Damproofg) <i>ROOFERS LOCAL 33</i>	03/01/2020	\$45.67	\$11.50	\$15.90	\$0.00	\$73.07
	08/01/2020	\$47.10	\$11.50	\$15.90	\$0.00	\$74.50
	02/01/2021	\$48.53	\$11.50	\$15.90	\$0.00	\$75.93
	08/01/2021	\$49.96	\$11.50	\$15.90	\$0.00	\$77.36
	02/01/2022	\$51.39	\$11.50	\$15.90	\$0.00	\$78.79

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - ROOFER - Local 33

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.84	\$11.50	\$3.69	\$0.00	\$38.03
2	60	\$27.40	\$11.50	\$15.90	\$0.00	\$54.80
3	65	\$29.69	\$11.50	\$15.90	\$0.00	\$57.09
4	75	\$34.25	\$11.50	\$15.90	\$0.00	\$61.65
5	85	\$38.82	\$11.50	\$15.90	\$0.00	\$66.22

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.55	\$11.50	\$3.69	\$0.00	\$38.74
2	60	\$28.26	\$11.50	\$15.90	\$0.00	\$55.66
3	65	\$30.62	\$11.50	\$15.90	\$0.00	\$58.02
4	75	\$35.33	\$11.50	\$15.90	\$0.00	\$62.73
5	85	\$40.04	\$11.50	\$15.90	\$0.00	\$67.44

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
 Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
 (Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE	03/01/2020	\$45.92	\$11.50	\$15.90	\$0.00	\$73.32
ROOFERS LOCAL 33	08/01/2020	\$47.35	\$11.50	\$15.90	\$0.00	\$74.75
	02/01/2021	\$48.78	\$11.50	\$15.90	\$0.00	\$76.18
	08/01/2021	\$50.21	\$11.50	\$15.90	\$0.00	\$77.61
	02/01/2022	\$51.64	\$11.50	\$15.90	\$0.00	\$79.04

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER	02/01/2020	\$49.36	\$13.35	\$24.12	\$2.61	\$89.44
SHEETMETAL WORKERS LOCAL 17 - A	08/01/2020	\$50.67	\$13.50	\$24.12	\$2.65	\$90.94
	02/01/2021	\$52.32	\$13.50	\$24.12	\$2.70	\$92.64
	08/01/2021	\$54.07	\$13.50	\$24.12	\$2.75	\$94.44
	02/01/2022	\$55.82	\$13.50	\$24.12	\$2.80	\$96.24

Apprentice - SHEET METAL WORKER - Local 17-A

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$20.73	\$13.35	\$5.89	\$0.00	\$39.97
2	42	\$20.73	\$13.35	\$5.89	\$0.00	\$39.97
3	47	\$23.20	\$13.35	\$11.13	\$1.43	\$49.11
4	47	\$23.20	\$13.35	\$11.13	\$1.43	\$49.11
5	52	\$25.67	\$13.35	\$12.08	\$1.53	\$52.63
6	52	\$25.67	\$13.35	\$12.33	\$1.54	\$52.89
7	60	\$29.62	\$13.35	\$13.70	\$1.70	\$58.37
8	65	\$32.08	\$13.35	\$15.15	\$1.80	\$62.38
9	75	\$37.02	\$13.35	\$16.56	\$2.01	\$68.94
10	85	\$41.96	\$13.35	\$17.96	\$2.20	\$75.47

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$21.28	\$13.50	\$5.89	\$0.00	\$40.67
2	42	\$21.28	\$13.50	\$5.89	\$0.00	\$40.67
3	47	\$23.81	\$13.50	\$11.13	\$1.45	\$49.89
4	47	\$23.81	\$13.50	\$11.13	\$1.45	\$49.89
5	52	\$26.35	\$13.50	\$12.08	\$1.56	\$53.49
6	52	\$26.35	\$13.50	\$12.33	\$1.57	\$53.75
7	60	\$30.40	\$13.50	\$13.70	\$1.73	\$59.33
8	65	\$32.94	\$13.50	\$15.15	\$1.83	\$63.42
9	75	\$38.00	\$13.50	\$16.56	\$2.04	\$70.10
10	85	\$43.07	\$13.50	\$17.96	\$2.24	\$76.77

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	06/01/2020	\$35.44	\$12.41	\$13.72	\$0.00	\$61.57
	08/01/2020	\$35.44	\$12.91	\$13.72	\$0.00	\$62.07
	12/01/2020	\$35.44	\$12.91	\$14.82	\$0.00	\$63.17
	06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
	08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
	12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66
SPECIALIZED EARTH MOVING EQUIP > 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	06/01/2020	\$35.73	\$12.41	\$13.72	\$0.00	\$61.86
	08/01/2020	\$35.73	\$12.91	\$13.72	\$0.00	\$62.36
	12/01/2020	\$35.73	\$12.91	\$14.82	\$0.00	\$63.46
	06/01/2021	\$36.53	\$12.91	\$14.82	\$0.00	\$64.26
	08/01/2021	\$36.53	\$13.41	\$14.82	\$0.00	\$64.76
	12/01/2021	\$36.53	\$13.41	\$16.01	\$0.00	\$65.95

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPRINKLER FITTER <i>SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2</i>	03/01/2020	\$54.74	\$9.68	\$20.55	\$0.00	\$84.97
	10/01/2020	\$56.09	\$9.68	\$20.55	\$0.00	\$86.32
	03/01/2021	\$57.44	\$9.68	\$20.55	\$0.00	\$87.67

Apprentice - SPRINKLER FITTER - Local 550 (Section B) Zone 2

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$19.16	\$9.68	\$11.61	\$0.00	\$40.45
2	40	\$21.90	\$9.68	\$12.30	\$0.00	\$43.88
3	45	\$24.63	\$9.68	\$12.99	\$0.00	\$47.30
4	50	\$27.37	\$9.68	\$13.73	\$0.00	\$50.78
5	55	\$30.11	\$9.68	\$14.36	\$0.00	\$54.15
6	60	\$32.84	\$9.68	\$15.05	\$0.00	\$57.57
7	65	\$35.58	\$9.68	\$15.74	\$0.00	\$61.00
8	70	\$38.32	\$9.68	\$16.43	\$0.00	\$64.43
9	75	\$41.06	\$9.68	\$17.11	\$0.00	\$67.85
10	80	\$43.79	\$9.68	\$17.80	\$0.00	\$71.27

Effective Date - 10/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$19.63	\$9.68	\$11.61	\$0.00	\$40.92
2	40	\$22.44	\$9.68	\$12.30	\$0.00	\$44.42
3	45	\$25.24	\$9.68	\$12.99	\$0.00	\$47.91
4	50	\$28.05	\$9.68	\$13.73	\$0.00	\$51.46
5	55	\$30.85	\$9.68	\$14.36	\$0.00	\$54.89
6	60	\$33.65	\$9.68	\$15.05	\$0.00	\$58.38
7	65	\$36.46	\$9.68	\$15.74	\$0.00	\$61.88
8	70	\$39.26	\$9.68	\$16.43	\$0.00	\$65.37
9	75	\$42.07	\$9.68	\$17.11	\$0.00	\$68.86
10	80	\$44.87	\$9.68	\$17.80	\$0.00	\$72.35

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2020	\$40.13	\$13.00	\$17.12	\$0.00	\$70.25
	09/01/2020	\$41.20	\$13.00	\$17.16	\$0.00	\$71.36
	03/01/2021	\$42.66	\$13.00	\$17.27	\$0.00	\$72.93
	09/01/2021	\$44.32	\$13.00	\$17.38	\$0.00	\$74.70
	03/01/2022	\$45.83	\$13.00	\$17.49	\$0.00	\$76.32
	09/01/2022	\$47.55	\$13.00	\$17.62	\$0.00	\$78.17
	03/01/2023	\$49.11	\$13.00	\$17.73	\$0.00	\$79.84

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 03/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$18.06	\$13.00	\$0.54	\$0.00	\$31.60
2	45	\$18.06	\$13.00	\$0.54	\$0.00	\$31.60
3	50	\$20.07	\$13.00	\$14.00	\$0.00	\$47.07
4	50	\$20.07	\$13.00	\$14.00	\$0.00	\$47.07
5	55	\$22.07	\$13.00	\$14.31	\$0.00	\$49.38
6	60	\$24.08	\$13.00	\$14.62	\$0.00	\$51.70
7	65	\$26.08	\$13.00	\$14.94	\$0.00	\$54.02
8	70	\$28.09	\$13.00	\$15.25	\$0.00	\$56.34
9	75	\$30.10	\$13.00	\$15.56	\$0.00	\$58.66
10	80	\$32.10	\$13.00	\$15.87	\$0.00	\$60.97

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$18.54	\$13.00	\$0.57	\$0.00	\$32.11
2	45	\$18.54	\$13.00	\$0.57	\$0.00	\$32.11
3	50	\$20.60	\$13.00	\$14.02	\$0.00	\$47.62
4	50	\$20.60	\$13.00	\$14.02	\$0.00	\$47.62
5	55	\$22.66	\$13.00	\$14.33	\$0.00	\$49.99
6	60	\$24.72	\$13.00	\$14.64	\$0.00	\$52.36
7	65	\$26.78	\$13.00	\$14.96	\$0.00	\$54.74
8	70	\$28.84	\$13.00	\$15.28	\$0.00	\$57.12
9	75	\$30.90	\$13.00	\$15.59	\$0.00	\$59.49
10	80	\$32.96	\$13.00	\$15.90	\$0.00	\$61.86

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2020	\$53.34	\$10.75	\$21.94	\$0.00	\$86.03
	08/01/2020	\$54.69	\$10.75	\$22.09	\$0.00	\$87.53
	02/01/2021	\$55.33	\$10.75	\$22.09	\$0.00	\$88.17
	08/01/2021	\$56.73	\$10.75	\$22.25	\$0.00	\$89.73
	02/01/2022	\$57.32	\$10.75	\$22.25	\$0.00	\$90.32

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

Effective Date - 02/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.67	\$10.75	\$21.94	\$0.00	\$59.36
2	60	\$32.00	\$10.75	\$21.94	\$0.00	\$64.69
3	70	\$37.34	\$10.75	\$21.94	\$0.00	\$70.03
4	80	\$42.67	\$10.75	\$21.94	\$0.00	\$75.36
5	90	\$48.01	\$10.75	\$21.94	\$0.00	\$80.70

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.35	\$10.75	\$22.09	\$0.00	\$60.19
2	60	\$32.81	\$10.75	\$22.09	\$0.00	\$65.65
3	70	\$38.28	\$10.75	\$22.09	\$0.00	\$71.12
4	80	\$43.75	\$10.75	\$22.09	\$0.00	\$76.59
5	90	\$49.22	\$10.75	\$22.09	\$0.00	\$82.06

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2020	\$40.55	\$8.60	\$17.24	\$0.00	\$66.39
	12/01/2020	\$41.53	\$8.60	\$17.24	\$0.00	\$67.37
	06/01/2021	\$42.55	\$8.60	\$17.24	\$0.00	\$68.39
	12/01/2021	\$43.56	\$8.60	\$17.24	\$0.00	\$69.40

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2020	\$39.27	\$8.60	\$17.24	\$0.00	\$65.11
	12/01/2020	\$40.25	\$8.60	\$17.24	\$0.00	\$66.09
	06/01/2021	\$41.27	\$8.60	\$17.24	\$0.00	\$67.11
	12/01/2021	\$42.28	\$8.60	\$17.24	\$0.00	\$68.12

For apprentice rates see "Apprentice- LABORER"

TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2020	\$39.15	\$8.60	\$17.24	\$0.00	\$64.99
	12/01/2020	\$40.13	\$8.60	\$17.24	\$0.00	\$65.97
	06/01/2021	\$41.15	\$8.60	\$17.24	\$0.00	\$66.99
	12/01/2021	\$42.16	\$8.60	\$17.24	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$48.81	\$13.00	\$15.70	\$0.00	\$77.51
	12/01/2020	\$49.95	\$13.00	\$15.70	\$0.00	\$78.65
	06/01/2021	\$51.04	\$13.00	\$15.70	\$0.00	\$79.74
	12/01/2021	\$52.18	\$13.00	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2020	\$36.02	\$12.41	\$13.72	\$0.00	\$62.15
	08/01/2020	\$36.02	\$12.91	\$13.72	\$0.00	\$62.65
	12/01/2020	\$36.02	\$12.91	\$14.82	\$0.00	\$63.75
	06/01/2021	\$36.82	\$12.91	\$14.82	\$0.00	\$64.55
	08/01/2021	\$36.82	\$13.41	\$14.82	\$0.00	\$65.05
	12/01/2021	\$36.82	\$13.41	\$16.01	\$0.00	\$66.24
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	06/01/2020	\$51.38	\$8.60	\$17.69	\$0.00	\$77.67
	12/01/2020	\$52.36	\$8.60	\$17.69	\$0.00	\$78.65
	06/01/2021	\$53.38	\$8.60	\$17.69	\$0.00	\$79.67
	12/01/2021	\$54.39	\$8.60	\$17.69	\$0.00	\$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	06/01/2020	\$53.38	\$8.60	\$17.69	\$0.00	\$79.67
	12/01/2020	\$54.36	\$8.60	\$17.69	\$0.00	\$80.65
	06/01/2021	\$55.38	\$8.60	\$17.69	\$0.00	\$81.67
	12/01/2021	\$56.39	\$8.60	\$17.69	\$0.00	\$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2020	\$43.45	\$8.60	\$17.69	\$0.00	\$69.74
	12/01/2020	\$44.43	\$8.60	\$17.69	\$0.00	\$70.72
	06/01/2021	\$45.45	\$8.60	\$17.69	\$0.00	\$71.74
	12/01/2021	\$46.46	\$8.60	\$17.69	\$0.00	\$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2020	\$45.45	\$8.60	\$17.69	\$0.00	\$71.74
	12/01/2020	\$46.43	\$8.60	\$17.69	\$0.00	\$72.72
	06/01/2021	\$47.45	\$8.60	\$17.69	\$0.00	\$73.74
	12/01/2021	\$48.46	\$8.60	\$17.69	\$0.00	\$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>	06/01/2020	\$35.44	\$12.41	\$13.72	\$0.00	\$61.57
	08/01/2020	\$35.44	\$12.91	\$13.72	\$0.00	\$62.07
	12/01/2020	\$35.44	\$12.91	\$14.82	\$0.00	\$63.17
	06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
	08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
	12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66
WAGON DRILL OPERATOR <i>LABORERS - ZONE 2</i>	06/01/2020	\$34.31	\$8.60	\$15.77	\$0.00	\$58.68
	12/01/2020	\$35.20	\$8.60	\$15.77	\$0.00	\$59.57
	06/01/2021	\$36.12	\$8.60	\$15.77	\$0.00	\$60.49
	12/01/2021	\$37.03	\$8.60	\$15.77	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2020	\$49.33	\$13.00	\$15.70	\$0.00	\$78.03
	12/01/2020	\$50.48	\$13.00	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.58	\$13.00	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.73	\$13.00	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12 (Local 138)</i>	03/01/2020	\$54.61	\$12.07	\$17.26	\$0.00	\$83.94
	09/01/2020	\$56.11	\$12.07	\$17.26	\$0.00	\$85.44
	03/01/2021	\$57.61	\$12.07	\$17.26	\$0.00	\$86.94
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						

Outside Electrical - East

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$28.83	\$8.75	\$1.86	\$0.00	\$39.44
	08/30/2020	\$29.67	\$9.25	\$1.89	\$0.00	\$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$40.84	\$8.75	\$10.02	\$0.00	\$59.61
	08/30/2020	\$42.03	\$9.25	\$10.27	\$0.00	\$61.55
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$33.64	\$8.75	\$9.86	\$0.00	\$52.25
	08/30/2020	\$34.62	\$9.25	\$10.07	\$0.00	\$53.94
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$26.43	\$8.75	\$1.79	\$0.00	\$36.97
	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$40.84	\$8.75	\$14.10	\$0.00	\$63.69
	08/30/2020	\$42.03	\$9.25	\$14.35	\$0.00	\$65.63
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$36.04	\$8.75	\$10.65	\$0.00	\$55.44
	08/30/2020	\$37.09	\$9.25	\$10.87	\$0.00	\$57.21
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$21.62	\$8.75	\$1.65	\$0.00	\$32.02
	08/30/2020	\$22.25	\$9.25	\$1.67	\$0.00	\$33.17
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$26.43	\$8.75	\$1.79	\$0.00	\$36.97
	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2019	\$48.05	\$8.75	\$17.19	\$0.00	\$73.99
	08/30/2020	\$49.45	\$9.25	\$17.48	\$0.00	\$76.18

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - LINEMAN (Outside Electrical) - East Local 104

Effective Date - 09/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$28.83	\$8.75	\$3.36	\$0.00	\$40.94
2	65	\$31.23	\$8.75	\$3.44	\$0.00	\$43.42
3	70	\$33.64	\$8.75	\$3.51	\$0.00	\$45.90
4	75	\$36.04	\$8.75	\$5.08	\$0.00	\$49.87
5	80	\$38.44	\$8.75	\$5.15	\$0.00	\$52.34
6	85	\$40.84	\$8.75	\$5.23	\$0.00	\$54.82
7	90	\$43.25	\$8.75	\$7.30	\$0.00	\$59.30

Effective Date - 08/30/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$29.67	\$9.25	\$3.39	\$0.00	\$42.31
2	65	\$32.14	\$9.25	\$3.46	\$0.00	\$44.85
3	70	\$34.62	\$9.25	\$3.54	\$0.00	\$47.41
4	75	\$37.09	\$9.25	\$5.11	\$0.00	\$51.45
5	80	\$39.56	\$9.25	\$5.19	\$0.00	\$54.00
6	85	\$42.03	\$9.25	\$5.26	\$0.00	\$56.54
7	90	\$44.51	\$9.25	\$7.34	\$0.00	\$61.10

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$30.73	\$4.70	\$3.17	\$0.00	\$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.

*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

**ATTACHMENT B:
Forms Used During Bidding**

Sample Prime/General Contractor Certificate of Eligibility
Sample Sub-Bidder Certificate of Eligibility
Prime/General Contractor Update Statement
Sub-Bidder Update Statement
Blanket Deposit Bond
Form for General Bid
Form for Sub-Bid

Certificate of Eligibility

Contractor: CONTRACTOR

#05 6666

CONTRACTOR ADDRESS

CONTRACTOR CITY MA 00800

In accordance with M.G.L. Chapter 149, Section 44D and 810-CMR 4.00, you are hereby certified to file bids under Chapter 149, Section 44A in the following categories:

Exterior Siding

General Building Construction

Painting

Your Single Project Limit is: \$2,500,000

Your Aggregate Work Limit is: \$5,000,000

This certificate is valid from 10/15/2005 to 10/15/2006

George M. Matthews, Deputy General Counsel
for David B. Perini, Commissioner

Date

Official DCAM Amendments Date Authorization

Extension to: _____

Name: _____

SPL: _____

GBC SPL: _____

AWL: _____

Category: _____

Address: _____

Sub-Bidder Certificate of Eligibility

#05 6666

Contractor: CONTRACTOR
CONTRACTOR ADDRESS
CONTRACTOR CITY MA 00000

In accordance with M.G.L. Chapter 149, Section 44D and 810 CMR 4.00, you are hereby certified to file sub-bids under Chapter 149, Section 44A in the following categories:

Metal Windows

Glass & Glazing

The average numerical value on projects evaluated by 89
Number of prior construction projects evaluated by BCAM on this 15
Number of projects given numerical values below a passing score: 1

This certificate is valid 10/16/200 to 10/16/2006

George M. Matthews, Deputy General Counsel Date
for David B. Perini, Commissioner

Official DCAM Amendments Date Authorization

Extension to:
Name:
Category:
Address:

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

EFFECTIVE MARCH 30, 2010

Commonwealth of Massachusetts
Division of Capital Asset Management
PRIME/GENERAL CONTRACTOR
UPDATE STATEMENT

TO ALL BIDDERS AND AWARDING AUTHORITIES

A COMPLETED AND SIGNED PRIME/GENERAL CONTRACTOR UPDATE STATEMENT MUST BE SUBMITTED WITH EVERY PRIME/GENERAL BID FOR A CONTRACT PURSUANT TO M.G.L. c.149, §44A AND M.G.L. c. 149A. ANY PRIME/GENERAL BID SUBMITTED WITHOUT AN APPROPRIATE UPDATE STATEMENT IS INVALID AND MUST BE REJECTED.

Caution: This form is to be used for submitting Prime/General Contract bids. It is not to be used for submitting Filed Sub-Bids or Trade Sub-Bids.

AWARDING AUTHORITIES

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

BIDDER'S AFFIDAVIT

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

Bid Date

Print Name of Prime/General Contractor

Project Number (or
name if no number)

Business Address

Awarding Authority

Telephone Number

SIGNATURE⇒

Bidder's Authorized Representative

INSTRUCTIONS

INSTRUCTIONS TO BIDDERS

- This form must be completed and submitted by all Prime/General contractors bidding on projects pursuant to M.G.L. c. 149, §44A and M.G.L. c. 149A.
- You must give complete and accurate answers to all questions and provide all of the information requested. **MAKING A MATERIALLY FALSE STATEMENT IN THIS UPDATE STATEMENT IS GROUNDS FOR REJECTING YOUR BID AND FOR DEBARRING YOU FROM ALL PUBLIC CONTRACTING.**
- **This Update Statement must include all requested information that was not previously reported on the Application used for your firm's most recently issued (not extended or amended) Prime/General Contractor Certificate of Eligibility. The Update Statement must cover the entire period since the date of your Application, NOT since the date of your Certification.**
- You must use this official form of Update Statement. Copies of this form may be obtained from the awarding authority and from the Asset Management Web Site: www.mass.gov/dcam.
- If additional space is needed, please copy the appropriate page of this Update Statement and attach it as an additional sheet.
- See the section entitled "Bidding Limits" in the *Instructions to Awarding Authorities* for important information concerning your bidding limits.

INSTRUCTIONS TO AWARDING AUTHORITIES

Determination of Bidder Qualifications

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

Bidding Limits

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

Aggregate Work Limit: The annual value of the work to be performed on the contract for which the bid is submitted,

when added to the annual cost to complete the bidder's other currently held contracts, may not exceed the bidder's Aggregate Work Limit. Use the following procedure to determine whether the low bidder is within its Aggregate Work Limit:

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

Step 2 Determine the annual dollar value of the work to be performed on your project. This is done as follows:

- (i) If the project is to be completed in less than 12 months, the annual dollar value of the work is equal to the full amount of the bid.
- (ii) If the project will take more than 12 months to complete, calculate the number of years given to complete the project by dividing the total number of months in the project schedule by 12 (calculate to 3 decimal places), then divide the amount of the bid by the calculated number of years to find the annual dollar value of the work.

Step 3 Add the annualized value of all of the bidder's incomplete contract work (the total of column 9 on page 5) to the annual dollar value of the work to be performed on your project. **The total may not exceed the bidder's Aggregate Work Limit.**

Correction of Errors and Omissions in Update Statements

Matters of Form: An awarding authority shall not reject a contractor's bid because there are mistakes or omissions of form in the Update Statement submitted with the bid, provided the contractor promptly corrects those mistakes or omissions upon request of the awarding authority. [810 CMR 8.05(1)].

Correction of Other Defects: An awarding authority may, in its discretion, give a contractor notice of defects, other than mistakes or omissions of form, in the contractor's Update Statement, and an opportunity to correct such defects, provided the correction of such defects is not prejudicial to fair competition. An awarding authority may reject a corrected Update Statement if it contains unfavorable information about the contractor that was omitted from the Update Statement filed with the contractor's bid. [810 CMR 8.05(2)].

PART 1 - COMPLETED PROJECTS

LIST ALL PUBLIC AND PRIVATE *BUILDING* PROJECTS YOUR FIRM HAS COMPLETED SINCE THE DATE OF APPLICATION FOR YOUR MOST RECENTLY ISSUED (NOT EXTENDED OR AMENDED) DCAM CERTIFICATE OF ELIGIBILITY. YOU MUST REPORT ALL REQUESTED INFORMATION NOT PREVIOUSLY REPORTED ON THAT DCAM APPLICATION*.

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

Attach additional sheets if necessary

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

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

PROJECT TITLE	COMPANY NAME	CONTACT PERSON	TELEPHONE
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above, either through a business or family relationship? YES NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? YES NO

If you have answered YES to either question, explain. _____

PART 2 - CURRENTLY HELD CONTRACTS

LIST ALL PUBLIC AND PRIVATE BUILDING AND NON-BUILDING *CONSTRUCTION* PROJECTS YOUR FIRM HAS UNDER CONTRACT ON THIS DATE REGARDLESS OF WHEN OR WHETHER THE WORK COMMENCED.

1	2	3	4	5	6	7	8	9
PROJECT TITLE & LOCATION	WORK CATEGORY	START AND END DATES	ON SCHEDULE (yes / no)	CONTRACT PRICE	% NOT COMPLETE	\$ VALUE OF WORK NOT COMPLETE (col. 5 X col. 6)	NO. OF YEARS REMAINING (see note below)	ANNUALIZED VALUE OF INCOMPLETE WORK (col. 7 ÷ col. 8) (divided by)

ANNUALIZED VALUE OF ALL INCOMPLETE CONTRACT WORK (Total of Column 9)

\$ _____

Column 8

- If less than one year is left in the project schedule, write 1.
- If more than 12 months are left in the project schedule, divide the number of months left in the project schedule by 12 (calculate to three decimal places).

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

PROJECT TITLE	COMPANY NAME	CONTACT PERSON	TELEPHONE
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above either through a business or family relationship? YES NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? YES NO

If you have answered YES to either question, explain. _____

PART 3 - PROJECT PERFORMANCE

For Parts 3 and 4, if you answer YES to any question, please provide on a separate page a complete explanation. Information you provide herein must supplement the Application for your most recently issued (not extended or amended) DCAM Certificate of Eligibility. You must report all requested information not previously reported on that DCAM Application for Prime/General Certificate of Eligibility. Include all details [project name(s) and location(s), names of all parties involved, relevant dates, etc.].

	YES	NO
1. Has your firm been terminated on any contract prior to completing a project or has any officer, partner or principal of your firm been an officer, partner or principal of another firm that was terminated or failed to complete a project?	<input type="checkbox"/>	<input type="checkbox"/>
2. Has your firm failed or refused either to perform or complete any of its work under any contract prior to substantial completion?	<input type="checkbox"/>	<input type="checkbox"/>
3. Has your firm failed or refused to complete any punch list work under any contract?	<input type="checkbox"/>	<input type="checkbox"/>
4. Has your firm filed for bankruptcy, or has any officer, principal or individual with a financial interest in your current firm been an officer, principal or individual with a financial interest in another firm that filed for bankruptcy?	<input type="checkbox"/>	<input type="checkbox"/>
5. Has your surety taken over or been asked to complete any of your work under any contract?	<input type="checkbox"/>	<input type="checkbox"/>
6. Has a payment or performance bond been invoked against your current firm, or has any officer, principal or individual with a financial interest in your current firm been an officer, principal or individual with a financial interest in another firm that had a payment or performance bond invoked?	<input type="checkbox"/>	<input type="checkbox"/>
7. Has your surety made payment to a materials supplier or other party under your payment bond on any contract?	<input type="checkbox"/>	<input type="checkbox"/>
8. Has any subcontractor filed a demand for direct payment with an awarding authority for a public project on any of your contracts?	<input type="checkbox"/>	<input type="checkbox"/>
9. Have any of your subcontractors or suppliers filed litigation to enforce a mechanic's lien against property in connection with work performed or materials supplied under any of your contracts?	<input type="checkbox"/>	<input type="checkbox"/>
10. Have there been any deaths of an employee or others occurring in connection with any of your projects?	<input type="checkbox"/>	<input type="checkbox"/>
11. Has any employee or other person suffered an injury in connection with any of your projects resulting in their inability to return to work for a period in excess of one year?	<input type="checkbox"/>	<input type="checkbox"/>

PART 4 - Legal or Administrative Proceedings; Compliance with Laws

Please answer the following questions. Information must supplement all judicial and administrative proceedings involving bidder’s firm, which were instituted or concluded (adversely or otherwise) since your firm’s Application for your most recently issued (not extended or amended) Certificate of Eligibility. You must report all requested information not previously reported on that DCAM Application for Prime/General Certificate of Eligibility.

The term “administrative proceeding” as used in this Prime/General Contractor Update Statement includes (i) any action taken or proceeding brought by a governmental agency, department or officer to enforce any law, regulation, code, legal, or contractual requirement, except for those brought in state or federal courts, or (ii) any action taken by a governmental agency, department or officer imposing penalties, fines or other sanctions for failure to comply with any such legal or contractual requirement.

The term “anyone with a financial interest in your firm” as used in this Section “I”, shall mean any person and/or entity with a 5% or greater ownership interest in the applicant’s firm.

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

	YES	NO
1. Have any civil, judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to the procurement or performance of any construction contract, including but not limited to actions to obtain payment brought by subcontractors, suppliers or others?	<input type="checkbox"/>	<input type="checkbox"/>
2. Have any criminal proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to the procurement or performance of any construction contract including, but not limited to, any of the following offenses: fraud, graft, embezzlement, forgery, bribery, falsification or destruction of records, or receipt of stolen property?	<input type="checkbox"/>	<input type="checkbox"/>
3. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state’s or federal procurement laws arising out of the submission of bids or proposals?	<input type="checkbox"/>	<input type="checkbox"/>
4. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of M.G.L. Chapter 268A, the State Ethics Law?	<input type="checkbox"/>	<input type="checkbox"/>

PART 4 - Legal or Administrative Proceedings; Compliance with Laws (continued)

	YES	NO
5. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state or federal law regulating hours of labor, unemployment compensation, minimum wages, prevailing wages, overtime pay, equal pay, child labor or worker's compensation?	<input type="checkbox"/>	<input type="checkbox"/>
6. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state or federal law prohibiting discrimination in employment?	<input type="checkbox"/>	<input type="checkbox"/>
7. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a claim of repeated or aggravated violation of any state or federal law regulating labor relations?	<input type="checkbox"/>	<input type="checkbox"/>
8. Have any proceedings by a municipal, state, or federal agency been brought, concluded, or settled relating to decertification, debarment, or suspension of your firm or any principal or officer or anyone with a financial interest in your firm from public contracting?	<input type="checkbox"/>	<input type="checkbox"/>
9. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of state or federal law regulating the environment?	<input type="checkbox"/>	<input type="checkbox"/>
10. Has your firm been fined by OSHA or any other state or federal agency for violations of any laws or regulations related to occupational health or safety? Note: this information may be obtained from OSHA's Web Site at www.osha.gov	<input type="checkbox"/>	<input type="checkbox"/>
11. Has your firm been sanctioned for failure to achieve DBE/MBE/WBE goals, workforce goals, or failure to file certified payrolls on any public projects?	<input type="checkbox"/>	<input type="checkbox"/>
12. Other than previously reported in the above paragraphs of this Section I, have any administrative proceedings or investigations involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled by any local, state or federal agency relating to the procurement or performance of any construction contract?	<input type="checkbox"/>	<input type="checkbox"/>
13. Are there any other issues that you are aware which may affect your firm's responsibility and integrity as a building contractor?	<input type="checkbox"/>	<input type="checkbox"/>

PART 5 - SUPERVISORY PERSONNEL

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

NAME	TITLE OR FUNCTION

PART 6 - CHANGES IN BUSINESS ORGANIZATION OR FINANCIAL CONDITION

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

PART 7 – LIST OF COMPLETED CONSTRUCTION PROJECTS SUBMITTED TO THE DIVISION OF CAPITAL ASSET MANAGEMENT.

Attach here a copy of the list of completed construction projects which was submitted with your firm’s DCAM Application for your most recently issued (not extended or amended) DCAM Certificate of Eligibility. The Attachment must include a complete copy of the entire Section G – “Completed Projects” and the final page – “Certification” (Section J) containing the signature and date that the Completed Projects list (Section G) was submitted to the Division of Capital Asset Management.

*

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

EFFECTIVE MARCH 30, 2010

Commonwealth of Massachusetts
Division of Capital Asset Management



SUB-BIDDER
UPDATE STATEMENT

TO ALL SUB-BIDDERS, TRADE CONTRACTORS AND AWARDING AUTHORITIES

A COMPLETED AND SIGNED SUB-BIDDER UPDATE STATEMENT MUST BE SUBMITTED WITH EVERY FILED SUB-BID PURSUANT TO M.G.L. c.149, §44F AND EVERY TRADE SUB-BID PURSUANT TO M.G.L. c. 149A. ANY FILED SUB-BID OR TRADE SUB-BID SUBMITTED WITHOUT AN APPROPRIATE SUB-BIDDER UPDATE STATEMENT IS INVALID AND MUST BE REJECTED.

Caution: This form is to be used for submitting Filed Sub-Bids and Trade Sub-Bids. It is not to be used for submitting Prime/General Contract bids.

AWARDING AUTHORITIES

If the Awarding Authority determines that the sub-bidder is not competent to perform the work as specified on the project, it should reject the bid.

SUB-BIDDER'S AFFIDAVIT

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

Bid Date

Print Name of Sub-bidder or Trade Contractor

Project Number (or
name if no number)

Business Address

Awarding Authority

Telephone Number

SIGNATURE⇒

Bidder's Authorized Representative

INSTRUCTIONS

INSTRUCTIONS TO SUB-BIDDERS

- This form must be completed and submitted by all Filed Sub-Bidders bidding on projects pursuant to M.G.L. c. 149, §44F and Trade Contractors bidding on projects pursuant to M.G.L. c. 149A.
- You must give complete and accurate answers to all questions and provide all of the information requested. **MAKING A MATERIALLY FALSE STATEMENT IN THIS SUB-BIDDER UPDATE STATEMENT IS GROUNDS FOR REJECTING YOUR BID AND FOR DEBARRING YOU FROM ALL PUBLIC CONTRACTING.**
- **This Sub-Bidder Update Statement must include all requested information that was not previously reported on the Application used for your firm's most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. The Sub-Bidder Update Statement must cover the entire period since the date of that Application, NOT since the date of your Certification.**
- You must use this official form of Sub-bidder Update Statement. Copies of this form may be obtained from the awarding authority and from the DCAM Web Site: www.mass.gov/dcam .
- If additional space is needed, please copy the appropriate page of this Sub-bidder Update Statement and attach it as an additional sheet.

INSTRUCTIONS TO AWARDING AUTHORITIES

Determination of Sub-Bidder Qualifications

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

Correction of Errors and Omissions in Sub-bidder Update Statements

Matters of Form: An awarding authority shall not reject a sub-bidder's bid because there are mistakes or omissions of form in the Sub-bidder Update Statement submitted with the bid pursuant to M.G.L. c.149, §44D, provided the sub-bidder promptly corrects those mistakes or omissions upon request of the awarding authority. [810 CMR 8.13(1)].

Correction of Other Defects: An awarding authority may, in its discretion, give a sub-bidder notice of minor defects and omissions as to form in the Sub-bidder's Update Statement and provide an opportunity to correct its Sub-bidder Update Statement. However, the sub-bidder shall not be allowed to make corrections to a Sub-bidder Update Statement if material information about the sub-bidder was omitted from the Sub-bidder Update Statement filed with the sub-bidder's bid. The Awarding Authority shall advise DCAM of any material omissions in a Sub-bidder's Update Statement.. [810 CMR 8.13(2)].

PART 1 - COMPLETED PROJECTS

LIST ALL PUBLIC AND PRIVATE PROJECTS OF \$20,000 OR MORE THAT YOUR FIRM HAS COMPLETED SINCE THE DATE OF APPLICATION FOR YOUR MOST RECENTLY ISSUED (NOT EXTENDED OR AMENDED) SUB-BIDDER CERTIFICATE OF ELIGIBILITY*.

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

Attach additional sheets if necessary

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

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

PROJECT TITLE	COMPANY NAME	CONTACT PERSON	TELEPHONE
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above, either through a business or family relationship? YES NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? YES NO

If you have answered YES to either question, explain. _____

PART 2 - CURRENTLY HELD CONTRACTS

LIST ALL PUBLIC AND PRIVATE PROJECTS OF \$20,000 OR MORE THAT YOUR FIRM HAS UNDER CONTRACT ON THIS DATE REGARDLESS OF WHEN OR WHETHER THE WORK COMMENCED.

1	2	3	4	5	6	7
PROJECT TITLE & LOCATION	WORK CATEGORY	START AND END DATES	ON SCHEDULE (yes / no)	CONTRACT PRICE	% NOT COMPLETE	\$ VALUE OF WORK NOT COMPLETE (col. 5 X col. 6)

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

PROJECT TITLE	COMPANY NAME	CONTACT PERSON	TELEPHONE
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone
	OWNER: Owner	Contact Person	Telephone
	DESIGNER: Designer	Contact Person	Telephone
	GC: GC	Contact Person	Telephone

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above either through a business or family relationship? YES NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? YES NO

If you have answered YES to either question, explain. _____

PART 3 - PROJECT PERFORMANCE

For Parts 3 and 4, if you answer YES to any question, please provide on a separate page a complete explanation. Information you provide herein must supplement the Application for your most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. You must report all requested information not previously reported on that Application. Include all details [project name(s) and location(s), names of all parties involved, relevant dates, etc.].

	YES	NO
1. Has your firm been terminated on any contract prior to completing a project or has any officer, partner or principal of your firm been an officer, partner or principal of another firm that was terminated or failed to complete a project?	<input type="checkbox"/>	<input type="checkbox"/>
2. Has your firm failed or refused either to perform or complete any of its work under any contract prior to substantial completion?	<input type="checkbox"/>	<input type="checkbox"/>
3. Has your firm failed or refused to complete any punch list work under any contract?	<input type="checkbox"/>	<input type="checkbox"/>
4. Has your firm filed for bankruptcy, or has any officer, principal or individual with a financial interest in your current firm been an officer, principal or individual with a financial interest in another firm that filed for bankruptcy?	<input type="checkbox"/>	<input type="checkbox"/>
5. Has your surety taken over or been asked to complete any of your work under any contract?	<input type="checkbox"/>	<input type="checkbox"/>
6. Has a payment or performance bond been invoked against your current firm, or has any officer, principal or individual with a financial interest in your current firm been an officer, principal or individual with a financial interest in another firm that had a payment or performance bond invoked?	<input type="checkbox"/>	<input type="checkbox"/>
7. Has your surety made payment to a materials supplier or other party under your payment bond on any contract?	<input type="checkbox"/>	<input type="checkbox"/>
8. Has any subcontractor filed a demand for direct payment with an awarding authority for a public project on any of your contracts?	<input type="checkbox"/>	<input type="checkbox"/>
9. Have any of your subcontractors or suppliers filed litigation to enforce a mechanic's lien against property in connection with work performed or materials supplied under any of your contracts?	<input type="checkbox"/>	<input type="checkbox"/>
10. Have there been any deaths of an employee or others occurring in connection with any of your projects?	<input type="checkbox"/>	<input type="checkbox"/>
11. Has any employee or other person suffered an injury in connection with any of your projects resulting in their inability to return to work for a period in excess of one year?	<input type="checkbox"/>	<input type="checkbox"/>

PART 4 - Legal or Administrative Proceedings; Compliance with Laws

Please answer the following questions. Information must supplement all judicial and administrative proceedings involving bidder’s firm, which were instituted or concluded (adversely or otherwise) since your firm’s Application for your most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. You must report all requested information not previously reported on that DCAM Application.

The term “administrative proceeding” as used in this Sub-Bidder Update Statement includes (i) any action taken or proceeding brought by a governmental agency, department or officer to enforce any law, regulation, code, legal, or contractual requirement, except for those brought in state or federal courts, or (ii) any action taken by a governmental agency, department or officer imposing penalties, fines or other sanctions for failure to comply with any such legal or contractual requirement.

The term “anyone with a financial interest in your firm” as used in this Section “P”, shall mean any person and/or entity with a 5% or greater ownership interest in the applicant’s firm.

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

	YES	NO
1. Have any civil, judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to the procurement or performance of any construction contract, including but not limited to actions to obtain payment brought by subcontractors, suppliers or others?	<input type="checkbox"/>	<input type="checkbox"/>
2. Have any criminal proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to the procurement or performance of any construction contract including, but not limited to, any of the following offenses: fraud, graft, embezzlement, forgery, bribery, falsification or destruction of records, or receipt of stolen property?	<input type="checkbox"/>	<input type="checkbox"/>
3. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state’s or federal procurement laws arising out of the submission of bids or proposals?	<input type="checkbox"/>	<input type="checkbox"/>
4. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of M.G.L. Chapter 268A, the State Ethics Law?	<input type="checkbox"/>	<input type="checkbox"/>

PART 4 - Legal or Administrative Proceedings; Compliance with Laws (continued)

	YES	NO
5. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state or federal law regulating hours of labor, unemployment compensation, minimum wages, prevailing wages, overtime pay, equal pay, child labor or worker's compensation?	<input type="checkbox"/>	<input type="checkbox"/>
6. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state or federal law prohibiting discrimination in employment?	<input type="checkbox"/>	<input type="checkbox"/>
7. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a claim of repeated or aggravated violation of any state or federal law regulating labor relations?	<input type="checkbox"/>	<input type="checkbox"/>
8. Have any proceedings by a municipal, state, or federal agency been brought, concluded, or settled relating to decertification, debarment, or suspension of your firm or any principal or officer or anyone with a financial interest in your firm from public contracting?	<input type="checkbox"/>	<input type="checkbox"/>
9. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of state or federal law regulating the environment?	<input type="checkbox"/>	<input type="checkbox"/>
10. Has your firm been fined by OSHA or any other state or federal agency for violations of any laws or regulations related to occupational health or safety? Note: this information may be obtained from OSHA's Web Site at www.osha.gov	<input type="checkbox"/>	<input type="checkbox"/>
11. Has your firm been sanctioned for failure to achieve DBE/MBE/WBE goals, workforce goals, or failure to file certified payrolls on any public projects?	<input type="checkbox"/>	<input type="checkbox"/>
12. Other than previously reported in the above paragraphs of this Section I, have any administrative proceedings or investigations involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled by any local, state or federal agency relating to the procurement or performance of any construction contract?	<input type="checkbox"/>	<input type="checkbox"/>
13. Are there any other issues that you are aware which may affect your firm's responsibility and integrity as a building contractor?	<input type="checkbox"/>	<input type="checkbox"/>

PART 5 - SUPERVISORY PERSONNEL

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

NAME	TITLE OR FUNCTION

PART 6 - CHANGES IN BUSINESS ORGANIZATION OR FINANCIAL CONDITION

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

PART 7 – LIST OF COMPLETED CONSTRUCTION PROJECTS SUBMITTED TO THE DIVISION OF CAPITAL ASSET MANAGEMENT ALONG WITH CERTIFICATION PAGE.

Attach here a copy of the list of completed construction projects which was submitted with your firm’s Application for your most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. The Attachment must include a complete copy of the entire Section F – “Completed Projects” (Section G – “Completed Projects” for firms certified based upon their Prime/General Application), and the final page – “Certification Page”, (Section I in the Sub-bidder Application or Section J in Prime/General Application) containing the signature and date that the Completed Projects list (Section F or G) was submitted to the Division of Capital Asset Management.



TO ALL CONTRACTORS -

**USE OF BLANKET DEPOSIT BOND FOR OBTAINING PLANS
AND SPECIFICATIONS FROM THE BID ROOM**

***A BLANKET DEPOSIT BOND IS NOT TO BE USED AS BID
SECURITY***

The Division of Capital Asset Management (DCAM) allows potential bidders and interested contractors wishing to obtain copies of project plans and specifications to file a \$500-\$5,000* plans and specifications blanket deposit bond with the Bid Room in lieu of payment of the usual company check as a deposit when obtaining plans and specifications. Attached is DCAM's sample Blanket Deposit Bond form. This sample bond provides the coverage DCAM requires for those seeking to avoid providing a company check each time plans and specifications are picked up at the Bid Room. **Please note that this form is not to be used for a Bid Bond or Bid Deposit and it should never be submitted with a bid.**

As a reminder, DCAM requires that all plans and specifications be returned to the Bid Room within 10 business days from the opening of the General Bids. Failure to return the plans and specifications within the time required will result in forfeiture of your plans and specifications deposit whether provided by check or by blanket deposit bond.

*\$1,000 is usually sufficient for most firms

****THIS IS NOT TO BE USED AS BID SECURITY****

**BLANKET DEPOSIT BOND FOR
DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE**

KNOW ALL MEN BY THESE PRESENTS:

THAT WE _____ OF* _____
_____ TEL: _____ AS
PRINCIPAL, AND THE _____ OF

_____, as Surety, are held and firmly bound to the Commonwealth of Massachusetts acting through its Division of Capital Asset Management and Maintenance, One Ashburton Place, Boston, MA 02108, as Oblige, for the sum of _____ for which sum, well and truly to be paid, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____ day of _____
20_____.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal will request, from time to time, plans and specifications issued by the Division of Capital Asset Management and Maintenance and whereas the Oblige will accept a BLANKET DEPOSIT BOND in lieu of separate deposit security on a project by project basis;

NOW, THEREFORE, if the principal well and truly complies with the rules and regulation applicable, thereto, then this obligation to be void; otherwise to remain in full force and effect.

THIS bond shall be in force from _____
_____ and may be continued year to year by a CONTINUATION CERTIFICATE executed by the SURETY.

Principal: _____ Seal

By: _____

Surety: _____ Seal

By: _____

Attorney-in-fact

*Please include your company name, full address, and telephone number. Thank you.

MUST BE EDITED FOR USE BY AWARDING AUTHORITY

**Executive Office for Administration and Finance
Division of Capital Asset Management and Maintenance
One Ashburton Place, 16th Floor, Room 1610, Bid Section
Boston, MA 02108
Telephone: (617) 727-4003**



**COMMONWEALTH OF MASSACHUSETTS
FORM FOR GENERAL BID**

M.G.L. c. 149, s. 44E as amended

The following must be attached to or inserted into this Bid:

1. Current Bidder's Certificate of Eligibility issued by the Division of Capital Asset Management and Maintenance showing the Bidder is certified in the category of work specified in the advertisement and the bid documents for this project.
2. Completed Contractor Update Statement (Form CQ3). NOTE: All information and the documents called for in the update statement must be supplied. All information provided must be complete and accurate. A defect or omission in the Update Statement may result in the rejection of the Bid. Part 5 MUST list the NAMES of all supervisory personnel for this project.
3. Bid deposit meeting the requirements of Section 5.13 and 5.14 of the Instructions to Bidders.

FORM FOR GENERAL BID

To the Awarding Authority:

A. The undersigned proposes to furnish all labor and materials required for

Project No. _____ Contract No. _____

Project Name: _____

in _____, Massachusetts, in accordance with the
accompanying plans and specifications prepared by _____

_____ (name of designer)

for the contract price specified below, subject to additions and deductions according to
the terms of the specifications.

B. This bid includes addenda numbered (list all addenda) _____.

C. The proposed contract price is

_____ (total bid in words)

dollars (\$ _____). [The unit price proposals are on page 2a.]

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

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

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

For Alternate No. 4: Add \$ _____ Subtract \$ _____

For Alternate No. 5: Add \$ _____ Subtract \$ _____

Name of General Bidder _____

The undersigned agrees that if it is selected as general contractor, it 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.

E. The undersigned agrees that, if it is selected as general contractor, it 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.

The undersigned hereby certifies that it 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 it will comply fully with all laws and regulations applicable to awards made subject to section forty-four A of Chapter 149 of the General Laws.

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.

The undersigned further certifies under penalties of perjury that the undersigned is not debarred from doing public construction work under any law, rule or regulation of the federal government.

The undersigned hereby declares that the undersigned has carefully examined the Advertisement, Instructions to Bidders, Owner - Contractor Agreement, General Conditions of the Contract, Special Conditions (if any), Plans and Specifications, all other Contract Documents, and also the Site upon which the proposed work is to be performed. The undersigned further declares that in regard to the conditions affecting the work to be done and the labor and materials needed, this proposal is based solely on the undersigned's

own investigation and research and not in reliance upon any representation of any employee, officer or agent of the Commonwealth.

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;
- we are the only persons interested in this proposal;
- that it is made without any connection with any other person making any bid for the same work and without directly or indirectly influencing or attempting to influence any other person to bid or to refrain from bidding or to influence the amount of the bid of any other person or corporation;
- that no person acting for, or employed by, the Commonwealth of Massachusetts is directly or indirectly interested in this proposal, or in any contract which be made under it, or in expected profits to arise therefrom.

As used above the word "person" shall mean natural person, joint venture, partnership, corporation or other business or legal entity.

The undersigned certifies that it shall comply with the provisions of the Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program set forth in Article XII of the General Conditions of the Contract.

Should the Contract Documents require submission of special data to accompany the bid, the Awarding Authority reserves the right to rule the bidder's failure to submit such data an informality and to receive said data subsequently within a reasonable time as set by the Awarding Authority.

Date _____, 200_.

(Name of General Bidder)

By _____
(Name and Title of Person Signing Bid)

(Business Address)

(City and State)

(Telephone Number)

(Facsimile Number)

The following information is furnished by the Bidder for the information of the Division of Capital Asset Management and Maintenance.

Is Bidder a corporation? ____ If so, incorporated in what state? _____

President _____

Secretary or Clerk _____

Treasurer _____

If Bidder is a foreign corporation, is it registered to do business in Massachusetts? _____

If Bidder is a foreign corporation and is selected, Bidder is required under M.G.L. c. 30, s. 39L to obtain from the Massachusetts Secretary of State, One Ashburton Place, 17th floor, a certificate stating that the corporation is registered to do business in Massachusetts, and to furnish said certificate to the awarding authority prior to the award.

Is Bidder a general partnership or joint venture? ____ If so, name each partner or venturer _____

Is Bidder a limited partnership? _____

Is Bidder registered in Massachusetts? ____ If so, name each general partner _____

If Bidder is a foreign limited partnership and is selected, Bidder is required under M.G.L. c. 30, s. 39L to obtain from the Massachusetts Secretary of State, One Ashburton Place, 17th floor, a certificate stating that the partnership is registered to do business in Massachusetts, and to furnish said certificate to the awarding authority prior to the award.

For each general partner or venturer that is a corporation, provide the following information (use additional sheets if necessary):

Name of corporation _____

State of incorporation _____

President _____

Secretary or Clerk _____

Treasurer _____

Name of corporation _____

State of incorporation _____

President _____

Secretary or Clerk _____

Treasurer _____

Is Bidder an individual? _____

Residence Address _____

Name under which Bidder does business _____

Business Address _____

If selected Bidder is an individual doing business under a different name then Bidder must furnish evidence of any required DBA filing.

MUST BE EDITED FOR USE BY AWARDING AUTHORITY

**Executive Office for Administration and Finance
Division of Capital Asset Management and Maintenance
One Ashburton Place, 16th Floor, Room 1610, Bid Section
Boston, MA 02108
Telephone: (617) 727-4003**



**COMMONWEALTH OF MASSACHUSETTS
FORM FOR SUB-BID**

M.G.L. c. 149, s. 44F as amended

The following must be attached to or inserted into this Sub-Bid or Trade Bid:

1. Current Sub-Bidder Certificate of Eligibility issued by the Division of Capital Asset Management and Maintenance showing the Sub-Bidder or Trade Contractor is certified in the category of work for which this Sub-Bid is submitted.
2. Completed Sub-Bidder Update Statement. NOTE: All information and the documents called for in the update statement must be supplied. All information provided must be complete and accurate. A defect or omission in the Update Statement may result in the rejection of the Bid. Part 5 MUST list the NAMES of all supervisory personnel for this project.
3. Bid deposit meeting the requirements of Section 5.13 and 5.14 of the Instructions to Bidders.

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 _____ for
(designer)

(project number)

(project name)

in _____, Massachusetts, for the Contract sum of
(city/town)

_____ dollars

(\$ _____).

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

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

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

For Alternate No. 4: Add \$ _____ Subtract \$ _____

For Alternate No. 5: Add \$ _____ Subtract \$ _____

B. This sub-bid includes addenda numbered (list all addenda) _____

Name of Sub-bidder _____

- C. This sub-bid
- May be used by any general bidder except: _____
- May only be used by the following general bidders: _____

(To exclude general bidders, insert "X" in one box only and fill in blank following that box. Do not answer C if no general bidders are excluded.)

D. The undersigned agrees that, if it is selected as a sub-bidder, it will, within five days, Saturdays, Sundays, and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such general bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and if requested so to do in the general bid by such general bidder, who shall pay the premiums therefore, 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 describe Plans, Specifications, including all general conditions stated therein, and addenda, and to assume toward the general Contractor all the obligations and responsibilities that the general Contractor, by those documents, assumes toward the Commonwealth.

H. The undersigned offers the following information as evidence of its qualifications to perform the work as bid upon according to all the requirements of the Plans and specification:

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 Designer on which you served as a subcontractor for work of similar character as required for the above named building.

	Building	Designer	General Contractor	Amount of Contract
(a)	_____	_____	_____	_____
(b)	_____	_____	_____	_____
(c)	_____	_____	_____	_____

4. Bank reference _____.

I. The undersigned hereby certifies that it 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 it will comply fully with all laws and regulations applicable to awards of subcontracts subject to section forty-four F of Chapter 149 of the General Laws.

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 work "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Date: _____

(Name of Sub-Bidder)

By: _____

(Title and Name of Person Signing)

(Business Address)

(Business Telephone No.)

Document ID:

Contractor’s DCAMM Certification Number:

Contractor’s Vendor Code Number:



**COMMONWEALTH OF MASSACHUSETTS
STANDARD VERTICAL CONSTRUCTION CONTRACT
For Projects Over \$100,000 Subject to M.G.L. c149, §44A -F**

OWNER - CONTRACTOR AGREEMENT

Awarding Authority: **Salem State University**

Department Code: **Facilities**

This agreement (“Contract”) is made as of the _____ day of **September 2020**, by and between the Commonwealth of Massachusetts acting by and through the Awarding Authority identified above with a principal place of business at **Stanley Building, Second Floor, 70 Loring Avenue, Salem, MA 01970**, and

_____, a corporation with a principal place of business at _____ hereinafter called the “Contractor.”

Terms used in this Owner - Contractor Agreement which are defined in the General Conditions of the Contract shall have the meanings designated therein.

The Awarding Authority and the Contractor agree as follows:

Article 1. Scope of Work. The Work under this Contract is defined as all work required by the

Contract Documents for the construction of **Administration Building Roof and Sidewalk Replacement**, Mass. State Project No. **SSU 2021-A**, Contract No. **1**, in accordance with and as described in the Plans and Specifications dated **July 31, 2020**, prepared by **Jones Architecture, Inc.** (“Designer”), as modified by Addenda Nos. _____ **respectively dated**

Article 2. Time for Completion. The Contractor shall commence the Work under this Contract on the date specified in the written “Notice to Proceed,” and shall, within **100** days after such date, bring the Work to Substantial Completion and to the point at which a Certificate of Agency Use and Occupancy may be issued, and shall bring the Work to Final Acceptance within 45 days after the date specified for Substantial Completion.

Article 3. Contract Price. The Awarding Authority shall pay the Contractor, in current funds, for the performance of the Work, subject to additions and deductions by Approved Change Order(s), the Contract Price of _____ (\$ _____). The Unit Prices, if any, approved by the Awarding Authority are those included in the Contractor’s General Bid. The following Alternates have been accepted and their costs are included in the Contract Price:

Alternate No(s):

Article 4. Approved Subcontractors. The filed Subcontractors listed in the Contractor’s General Bid submitted by the Contractor have been approved for the performance of the specified portions of the Work subject to the Commonwealth’s verification that they have complied with state corporation and partnership registration laws. No other filed Subcontractors and no non-filed Subcontractors shall be used for these or any other portions of the Work without the prior written approval of the Awarding Authority.

Article 5. Certifications. Pursuant to M.G.L. c. 62(c), s.49 (a), the individual signing this Contract on behalf of the Contractor hereby certifies, under the penalties of perjury, that to the best of his or her knowledge and belief the Contractor has complied with any and all applicable state and federal tax laws. The individual signing this Contract on behalf of the Contractor further certifies under penalties of perjury that the Contractor is not presently debarred from doing public construction work in the Commonwealth under the provisions of M.G.L. c. 29, s. 29F, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder and is not presently debarred from doing public construction work by any agency of the United States.

Article 6. The Contract Documents: The following documents form the Contract, are incorporated by reference herein, and are referred to as the “Contract Documents:”

- The Instructions to Bidders
- The General Bid submitted by the Contractor
- This Owner-Contractor Agreement

- The General Conditions of the Contract
- The Supplementary General Conditions [Note: the term “Supplementary General Conditions” may also refer to Division 1 of the Specifications.]
- The Plans and Specifications, including Addenda identified in Article 1 above
- All Approved Change Orders issued after execution of this Owner-Contractor Agreement

Article 7. Minority Business Enterprise and Women Business Enterprise Participation Goals and Minority/Women Workforce Utilization Percentages: The applicable goals, if any, for minority business enterprise and woman business enterprise participation established for this Contract are as follows:

The Minority Business Enterprise/Women Business Enterprise (MBE/WBE) participation goal for this Contract is a combined goal of 5.0% of the Contract Price.

The applicable minority workforce utilization percentage is 5.0%.

The applicable women workforce utilization percentage is 5.0%.

Contractors are requested to provide Service-Disabled Veteran-Owned Business Enterprises (SDVOBE) opportunities to participate on this Project.

Article 8. Liquidated Damages. For the purposes of Article VI of the General Conditions of the Contract, liquidated damages for delay shall be as follows:

\$2,000.00 per day

Article 9. Additional Insurance Provisions. The insurance requirements set forth in Article XIV of the General Conditions of the Contract are supplemented by the provisions, if any, appearing in Exhibit A attached hereto and incorporated herein.

In witness whereof, the parties hereto have caused this instrument to be executed in triplicate under seal as of the date set forth above.

CONTRACTOR:

By: _____

Name: _____

Title: _____

Date: _____

AWARDING AUTHORITY:

By executing this Agreement, the undersigned authorized signatory of the Awarding Authority, who incurs no personal liability by reason of the execution hereof or anything herein contained, hereby certifies under penalties of perjury that this Contract is executed in accordance with a prior approval of the Division of Capital Asset Management and Maintenance, and further certifies under the penalties of perjury that all the applicable provisions of M.G.L. c.149, §44J, have been complied with.

By: _____

Name: _____

Title: _____

Date: _____

Additional Signature Required where DCAMM is the Awarding Authority:

Approved as to Form:

By: _____

Name: _____

Title: _____

Date: _____

(Note: For Awarding Authorities other than DCAMM—if additional signatures are required, insert page 4a for these signatures.)

EXHIBIT A to the Owner-Contractor Agreement

Additional Insurance Provisions

(Insert any additions or modifications to the Insurance Requirements contained in Article XIV of the General Conditions of the Contract here or indicate “None.”)

EXHIBIT B to the Owner-Contractor Agreement

Forms Used During Contract Award and Execution

- Payment Bond
- Performance Bond
- Schedule for Participation by Minority and Women Business Enterprises
- Letter of Intent
- Certificate of Corporate Vote
- Certificate of Joint Venture
- Certificate of Compliance with State Tax Law
- Workforce Certification-Certificate of Compliance with Certain Workforce Related Legal Requirements
- DCAMM Trench Application & Permit & Excavator Permit Supplement

PAYMENT BOND

Know all men by these presents, that

_____ as principal, and _____ as surety, are held and firmly bound unto the Commonwealth of Massachusetts in the sum of

_____ in lawful money of the United States of America, to be paid to the Commonwealth of Massachusetts, for which payments, 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 Commonwealth acting through its _____ (“Awarding Authority”) bearing date of _____, 20____, for the construction of Project No. _____ Contract No. _____ Project Name _____

Now the condition of this obligation is such that if the principal shall 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 purpose or items set out in, and to be subject to, provisions of Massachusetts General Laws 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 virtue.

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

_____ (Seal)
(Print Name of General Contractor)

_____ (Seal)
(Print Name of Surety)

By _____
(Signature - Title)

(Signature - Title)

Surety Address _____

PERFORMANCE BOND

Know all men by these presents, that

_____ as principal, and _____ as surety, are held and firmly bound unto the Commonwealth of Massachusetts in the sum of

_____ in lawful money of the United States of America, to be paid to the Commonwealth of Massachusetts, for which payments, 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 Commonwealth, acting through its _____ (“Awarding Authority”), bearing date of _____, 20____, for the construction of Project No. _____ Contract No. _____ Project Name _____

Now the condition of this obligation is such that if the principal shall well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of said Contract and any extensions thereof that may be granted by the Commonwealth, with or without notice to the surety, and during the life of any guarantee required under the Contract, and shall also well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of any and all duly authorized modifications, alterations, changes or additions to said Contract that may hereafter be made, notice to the surety of such modifications, alterations, changes or additions being hereby waived, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

In the event that the Contract is abandoned by the Contractor, or is terminated by the Commonwealth under the provisions of said Contract, said surety shall, if requested in writing by the Commonwealth, take such action as is necessary to complete the Contract.

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

_____(Seal)
(Print Name of General Contractor

_____(Seal)
(Print Name of Surety)

BY _____
(Signature - Title)

BY _____
(Signature - Title)

Surety Address _____

SCHEDULE FOR PARTICIPATION
BY MINORITY/WOMEN BUSINESS ENTERPRISES
DIVISION OF CAPITAL ASSET MANAGEMENT

DCAM Project Number _____ Project Location _____

Project Name _____

- A. Filed Sub-bidders utilizing MBE/WBE firms, and MBE/WBE Sub-bidders – attach to Filed Sub-bid.
- B. General Contractor must submit to the Awarding Authority’s Compliance Office within five (5) working days of the opening of General Bids.

BIDDER CERTIFICATION:

The Bidder agrees that if awarded the contract it will expend at least the amount of the contract set forth below for MBE/WBE participation. For purposes of this commitment, the MBE and WBE designation means that a business has been certified by SOMWBA as either a MBE, WBE or M/WBE, see Article 7 of the Owner-Contractor Agreement. The Bidder must indicate the MBE/WBE firms it intends to utilize on the project as follows (attach additional sheets if necessary):

Company Name & Address	MBE or WBE	Describe MBE/WBE Scopes of Work (clarify “Labor Only”, “Material Only” or “Labor and Material”)	If Supplier, Indicate Total Value of Supplies (10% of total counts toward Participation)	Total Dollar Value of Participation
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

MBE Goal: \$ _____ Total Dollar Value of MBE Commitment: \$ _____

WBE Goal: \$ _____ Total Dollar Value of MBE Commitment: \$ _____

The undersigned hereby certifies that he/she has read the terms and conditions of the contract with regard to MBE/WBE participation and is authorized to bind the Bidder to the commitment set forth above.

Name of Firm _____ Authorized Signature _____

Business Address _____ Print Name _____

_____ Title _____

Telephone No. _____ Fax No. _____ Date _____

LETTER OF INTENT
MINORITY/WOMEN BUSINESS ENTERPRISES PARTICIPATION
DIVISION OF CAPITAL ASSET MANAGEMENT

(To be completed by MBE/WBE, and submitted by the General Bidder to the DCAM Compliance Office within five (5) working days of the opening of General Bids or by Filed Sub-bidder with its bid.)

DCAM Project Number _____ Indicate SOMWBA Certification:
 Project Name _____ ___ MBE
 Project Location _____ ___ WBE
 To _____ ___ M/WBE
Name of General Bidder/ Sub-bidder

1. This firm intends to perform work in connection with the above project.
2. This firm is currently certified by SOMWBA to perform the work identified below, and has not changed its minority/women ownership, control, or management without notifying SOMWBA within thirty (30) days of such a change.
3. This firm understands that if the General Bidder/Sub-bidder referenced above is awarded the contract, the Bidder intends to enter into an agreement with this firm to perform the activity described below for the prices indicated. This firm also understands that the above-referenced firm, as General Bidder/Sub-bidder, will make substitutions only as allowed by Article XIII of the Contract.
4. This firm understands that under the terms of Article XIII of the contract, only work actually performed by an MBE/WBE will be credited toward MBE/WBE participation goals, and this firm cannot assign or subcontract out any of its work without prior written approval of the DCAM Compliance Office, and that any such assignment or subcontracting will not be credited toward MBE/WBE participation goals.

MBE/WBE PARTICIPATION

Section/Item Number (if applicable)	Describe MBE/WBE Scopes of Work (clarify "Labor Only", "Material Only" or "Labor and Material")	If Supplier, Indicate Total Value of Supplies (10% of total counts toward Participation)	Dollar Value of Participation

Total Dollar Value: \$ _____

Name of MBE/WBE Firm _____

Authorized Signature _____

Business Address _____

Print Name _____

Title _____

Telephone No _____ Fax No. _____

Date _____

CERTIFICATE OF CORPORATE VOTE

_____ 20 _____

I hereby certify that I am the _____ clerk, _____, assistant clerk, of
_____ (the "Corporation") and that at a
(Name of Corporation)
duly authorized meeting of the Board of Directors of the Corporation held on
_____ in _____ at which a quorum was
(Date) (Location)
present and voting it was voted to authorize _____
(Name)
_____ of the Corporation to execute
(Officer Title)
and deliver on behalf of the Corporation the following contract and to act as principal to
execute bonds in connection therewith, which contract and bonds were presented to and
made a part of the records of said meeting:

Mass State Project No. _____

Project Title: _____

I further certify that _____ is the duly qualified and acting
(Name of Corporate Officer)

_____ of the Corporation and that said vote has not been
(Officer Title)
repealed, rescinded or amended.

Name

Date

(CORPORATE SEAL)

SUBSCRIBED AND SWORN TO THIS _____ DAY OF _____, 20____ BEFORE ME

Notary Public
My Commission Expires: _____

**CERTIFICATE OF JOINT VENTURE
(INCLUDING SIGNATURE AUTHORITY)**

This certificate is being given in connection with the execution by _____ (the "Joint Venture") of the following construction contract with the Commonwealth of Massachusetts:

In connection with the execution of the contract (the "Contract") the parties to the Joint Venture represent and warrant as follows:

1. Exhibit A attached hereto is a true and complete copy of the Joint Venture Agreement between the parties dated _____. Said Joint Venture Agreement is in full force and effect and has not been modified, amended, revoked, or terminated.

2. The principal place of business of the Joint Venture is as follows:

3. The Management Committee of the Joint Venture described in Section _____ of the Joint Venture Agreement continues to consist of

who together have the power to bind the Joint Venture and the parties thereto.

4. The Management Committee of the Joint Venture hereby appoints _____ as an authorized representative of the Joint Venture who shall have the power, individually, to execute any and all documents in connection with the Contract and whose signature shall be binding upon the Joint Venture. The Management Committee may modify or revoke such appointment, and may appoint additional authorized representative(s), only with the consent of the Commonwealth and only by a written document executed by the members of the Management Committee.

5. No changes in the Management Committee of the Joint Venture shall be effective without the written consent of the Commonwealth.

6. No amendments to the Joint Venture Agreement shall be effective without the written consent of the Commonwealth.

7. By executing this certificate

acknowledge that they are jointly and severally liable to the Commonwealth of Massachusetts for all obligations of the Joint Venture.

This certificate is executed under seal as of the dates set forth opposite the last signature below:

_____, a Massachusetts joint venture

By: _____, a Massachusetts corporation
having a principal place of business at _____
_____, its general partner

By: _____

Its: _____
hereunto duly authorized

Date: _____

By: _____, a Massachusetts corporation
having a principal place of business at _____
_____, its general partner.

By: _____

Its: _____
hereunto duly authorized

Date: _____

(Note: This certificate may have to be modified depending upon the terms of the joint venture agreement.)

**CERTIFICATE OF COMPLIANCE WITH STATE TAX LAWS AND
WITH UNEMPLOYMENT COMPENSATION CONTRIBUTION
REQUIREMENTS**

Pursuant to M.G.L., Ch. 62C, s. 49A and M.G.L., Ch. 151A, s. 19A, I,

_____ authorized signatory for

_____ whose principal place of business is at

_____ do hereby certify

under penalties of perjury that _____ has filed all state tax returns and paid all taxes as required by law and has complied with all state laws pertaining to contributions to the unemployment compensation fund and to payments in lieu of contributions.

The Business Organization Social Security Number or Federal Identification Number is

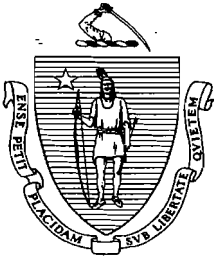
_____.

Signed under the penalties of perjury the _____ day of _____

20 ____.

Signature: _____

Name and Title: _____



OFFICE OF THE GOVERNOR
COMMONWEALTH OF MASSACHUSETTS
 STATE HOUSE • BOSTON, MA 02133
 (617) 725-4000

DEVAL L. PATRICK
 GOVERNOR

TIMOTHY P. MURRAY
 LIEUTENANT GOVERNOR

By His Excellency

DEVAL L. PATRICK
GOVERNOR

EXECUTIVE ORDER NO. 504

**ORDER REGARDING THE SECURITY AND
 CONFIDENTIALITY OF PERSONAL INFORMATION**

(Revoking and Superseding Executive Order 412)

WHEREAS, identity theft is a serious crime that, according to current Federal Trade Commission statistics, affects as many as 9 million Americans each year and costs consumers and businesses approximately \$52 billion annually;

WHEREAS, the Commonwealth of Massachusetts has recognized the growing threat of identity theft and taken steps to safeguard the personal information of its residents by, among other things, enacting Massachusetts General Laws Chapter 93H ("Chapter 93H");

WHEREAS, pursuant to Chapter 93H, the Massachusetts Office of Consumer Affairs and Business Regulation has promulgated regulations, effective January 1, 2009, defining security standards that must be met by persons, other than state entities, who own, license, store or maintain personal information about residents of the Commonwealth;

WHEREAS, also pursuant to Chapter 93H, the Secretary of the Commonwealth, through his Supervisor of Public Records, is charged

SECRETARY OF STATE
 RECORDS DIVISION
 2008 SEP 19 PM 1:41

with establishing rules or regulations designed to safeguard personal information that is owned or licensed by state executive offices and authorities;

WHEREAS, the Executive Department recognizes the importance of developing and implementing uniform policies and standards across state government to safeguard the security, confidentiality and integrity of personal information maintained by state agencies; and

WHEREAS, the implementation of such policies and standards will further the objectives of Chapter 93H and will demonstrate the Commonwealth's commitment to adhere to standards equal to or higher than those that govern the private sector.

NOW, THEREFORE, I, Deval L. Patrick, Governor of the Commonwealth of Massachusetts, by virtue of the authority vested in me by the Constitution, Part 2, c. 2, § 1, Art. I, do hereby revoke Executive Order 412 and order as follows:

Section 1. This Executive Order shall apply to all state agencies in the Executive Department. As used in this Order, "state agencies" (or "agencies") shall include all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established.

Section 2. It shall be the policy of the Executive Department of the Commonwealth of Massachusetts to adopt and implement the maximum feasible measures reasonably needed to ensure the security, confidentiality and integrity of personal information, as defined in Chapter 93H, and personal data, as defined in Massachusetts General Laws Chapter 66A, maintained by state agencies (hereafter, collectively, "personal information"). Each executive officer and agency head serving under the Governor, and all state employees, shall take immediate, affirmative steps to ensure compliance with this policy and with applicable federal and state privacy and information security laws and regulations.

Section 3. All state agencies shall develop, implement and maintain written information security programs governing their collection, use,

dissemination, storage, retention and destruction of personal information. The programs shall ensure that agencies collect the minimum quantity of personal information reasonably needed to accomplish the legitimate purpose for which the information is collected; securely store and protect the information against unauthorized access, destruction, use, modification, disclosure or loss; provide access to and disseminate the information only to those persons and entities who reasonably require the information to perform their duties; and destroy the information as soon as it is no longer needed or required to be maintained by state or federal record retention requirements. The security programs shall address, without limitation, administrative, technical and physical safeguards, and shall comply with all federal and state privacy and information security laws and regulations, including but not limited to all applicable rules and regulations issued by the Secretary of State's Supervisor of Public Records under Chapter 93H.

Section 4. Each agency's written information security program shall include provisions that relate to the protection of information stored or maintained in electronic form (hereafter, "electronic security plans"). The Commonwealth's Chief Information Officer ("CIO") shall have the authority to:

- Issue detailed guidelines, standards, and policies governing agencies' development, implementation and maintenance of electronic security plans;
- Require that agencies submit their electronic security plans to ITD for review, following which ITD shall either approve the plans, return them for amendment, or reject them and mandate the preparation of a new plan;
- Issue guidelines specifying when agencies will be required to prepare and submit supplemental or updated electronic security plans to ITD for approval;
- Establish periodic reporting requirements pursuant to which all agencies shall conduct and submit self-audits to ITD no less than annually, assessing the state of their implementation and compliance with their electronic security plans, with all guidelines, standards, and policies issued by ITD, and with all applicable federal and state privacy and information security laws and regulations;

- Conduct reviews to assess agency compliance with the governing plans, guidelines, standards, policies, laws and regulations. At the discretion of ITD, reviews may be conducted on site or electronically, and may be announced or unannounced;
- Issue policies requiring that incidents involving a breach of security or unauthorized acquisition or use of personal information be immediately reported to ITD and to such other entities as required by the notice provisions of Chapter 93H; and
- Where necessary and appropriate, and with the approval of the Secretary for Administration and Finance, determine and implement remedial courses of action to assist non-compliant agencies in achieving compliance with the governing plans, guidelines, standards, policies, laws and regulations. Such actions may include, without limitation, the imposition of terms and conditions relating to an agency's information technology ("IT")-related expenditures and use of IT capital funding.

Section 5. Each agency shall appoint an Information Security Officer ("ISO"), who may also hold another position within the agency. ISOs shall report directly to their respective Agency heads and shall coordinate their agency's compliance with the requirements of this Order, applicable federal and state laws and regulations, and ITD security standards and policies. All agency security programs, plans, self-audits, and reports required by this Order shall contain certifications signed by the responsible ISO and the responsible agency head attesting to the accuracy and completeness of the submissions.

Section 6. All agency heads, managers, supervisors, and employees (including contract employees) shall attend mandatory information security training within one year of the effective date of this Order. For future employees, such training shall be part of the standardized orientation provided at the time they commence work. Such training shall include, without limitation, guidance to employees regarding how to identify, maintain and safeguard records and data that contain personal information.

Section 7. The Enterprise Security Board (“ESB”), as presently established, shall advise the CIO in developing the guidelines, standards, and policies required by Section 4 of this Order. Consistent with the ESB’s current framework, the precise members and make-up of the ESB shall be determined by the CIO, but its membership shall be drawn from state employees across the Executive Department with knowledge and experience in the fields of information technology, privacy and security, together with such additional representatives from the Judicial and Legislative Branches, other constitutional offices, and quasi-public authorities who accept an invitation from the CIO to participate. The ESB shall function as a consultative body to advise the CIO in developing and promulgating guidelines, standards, and policies that reflect best practices to ensure the security, confidentiality and integrity of the electronic personal information collected, stored, used, and disseminated by the Commonwealth’s IT resources.

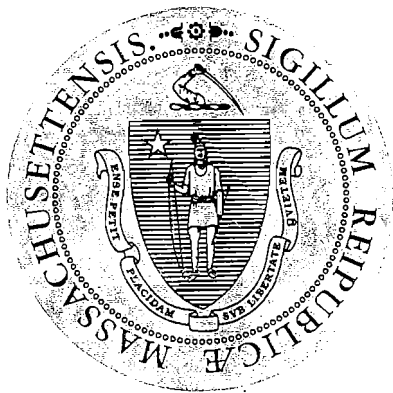
Section 8. The CIO shall develop mandatory standards and procedures for agencies to follow before entering into contracts that will provide third parties with access to electronic personal information or information technology systems containing such information. Such standards must require that appropriate measures be taken to verify the competency and integrity of contractors and subcontractors, minimize the data and systems to which they will be given access, and ensure the security, confidentiality and integrity of such data and systems.

Section 9. All contracts entered into by state agencies after January 1, 2009 shall contain provisions requiring contractors to certify that they have read this Executive Order, that they have reviewed and will comply with all information security programs, plans, guidelines, standards and policies that apply to the work they will be performing for their contracting agency, that they will communicate these provisions to and enforce them against their subcontractors, and that they will implement and maintain any other reasonable and appropriate security procedures and practices necessary to protect personal information to which they are given access as part of the contract from unauthorized access, destruction, use, modification, disclosure or loss. The foregoing contractual provisions shall be drafted by ITD, the Office of the Comptroller, and the Operational

Services Division, which shall develop and implement uniform language to be incorporated into all contracts that are executed by state agencies. The provisions shall be enforced through the contracting agency and the Operational Services Division. Any breach shall be regarded as a material breach of the contract that may subject the contractor to appropriate sanctions.

Section 10. In performing their responsibilities under this Order, ITD, the CIO and the Operational Services Division shall have the full cooperation of all state agencies, including compliance with all requests for information.

Section 11. This Executive Order shall take effect immediately and shall continue in effect until amended, superseded or revoked by subsequent Executive Order.



Given at the Executive Chamber in Boston this 19th day of September in the year of our Lord two thousand and eight, and of the Independence of the United States of America two hundred and thirty-two.

A handwritten signature in black ink, appearing to read "Deval Patrick", written over a horizontal line.

DEVAL L. PATRICK
GOVERNOR
Commonwealth of Massachusetts

A handwritten signature in black ink, appearing to read "William Francis Galvin", written over a horizontal line.

WILLIAM FRANCIS GALVIN
Secretary of the Commonwealth

GOD SAVE THE COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE ORDER 504 CONTRACTOR CERTIFICATION FORM

Effective January 1, 2009, [Executive Order 504](#) establishes new requirements designed to adopt and implement the maximum feasible measures reasonably needed to ensure the security, confidentiality and integrity of personal information, as defined in [M.G.L. c. 93H](#) and personal data, as defined in [M.G.L. c. 66A](#), maintained by state agencies (herein collectively "personal information"). This requirement only pertains to contracts that require the Contractor's access to personal information owned or controlled by the contracting agency and systems that contain such data. The Executive Order applies to all state agencies in the Executive Department, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established.

In order to comply with the contractor certification requirements of Executive Order 504, agencies must require that all vendors executing contracts on or after January 1, 2009 certify compliance with applicable security measures. The Commonwealth's Standard Contract Form and Instructions will be amended to include certification of compliance; however, until such time as the Standard Contract Form has been amended, agencies that are subject to Executive Order 504 can comply with this obligation by having vendors entering into any new agreements execute the separate certification form attached. The instructions below provide guidance concerning how to comply with the certification requirements of Executive Order 504.

1. For procurements that use the Standard Contract Form:
 - a. Until the revised Standard Contract form is issued, if the RFQ or RFR was posted on or before January 1, 2009, but the contract will not have been executed as of January 1, 2009, then vendors contracting with agencies must execute the separate Executive Order 504 Contractor Certification Form attached hereto as Exhibit A for all new contracts.
 - b. Once the Commonwealth's Standard Contract Form has been amended, agencies will be in compliance with the certification requirements of Executive Order 504 by having vendors execute the Standard Contract Form as part of the bidder's response to an RFR or RFQ.
2. After January 1, 2009, in any instances where the agency is not using the Commonwealth's Standard Contract Form, the agency must have all vendors execute a separate Executive Order 504 Certification Form, which is attached to this document.
3. After January 1, 2009, Departments executing contract amendments or renewals with existing vendors are encouraged to request execution of a separate Executive Order 504 Contractor Certification Form by those vendors if the vendor has not executed the new version of the Standard Contract Form containing the Executive Order 504 certifications.

Executive Order 504 Contractor Certification Form

BIDDER/CONTRACTOR LEGAL NAME:

BIDDER/CONTRACTOR VENDOR/CUSTOMER CODE:

Executive Order 504: For all Contracts involving the Contractor's access to personal information, as defined in M.G.L. c. 93H, and personal data, as defined in M.G.L. c. 66A, owned or controlled by Executive Department agencies, or access to agency systems containing such information or data (herein collectively "personal information"), Contractor certifies under the pains and penalties of perjury that the Contractor (1) has read Commonwealth of Massachusetts [Executive Order 504](#) and agrees to protect any and all personal information; and (2) has reviewed all of the Commonwealth of Massachusetts [Information Technology Division's Security Policies](#) under Policies and Standards.

Notwithstanding any contractual provision to the contrary, in connection with the Contractor's performance under this Contract, for all state agencies in the Executive Department, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established, the Contractor shall:

- (1) obtain a copy, review, and comply with the contracting agency's Information Security Program (ISP) and any pertinent security guidelines, standards and policies; (2) comply with all of the Commonwealth of Massachusetts Information Technology Division's Security Policies ("Security Policies") available at www.mass.gov/ITD under Policies and Standards;
- (2) communicate and enforce the contracting agency's ISP and such Security Policies against all employees (whether such employees are direct or contracted) and subcontractors;
- (3) implement and maintain any other reasonable appropriate security procedures and practices necessary to protect personal information to which the Contractor is given access by the contracting agency from the unauthorized access, destruction, use, modification, disclosure or loss;
- (4) be responsible for the full or partial breach of any of these terms by its employees (whether such employees are direct or contracted) or subcontractors during or after the term of this Contract, and any breach of these terms may be regarded as a material breach of this Contract;
- (5) in the event of any unauthorized access, destruction, use, modification, disclosure or loss of the personal information (collectively referred to as the "unauthorized use"): (a) immediately notify the contracting agency if the Contractor becomes aware of the unauthorized use; (b) provide full cooperation and access to information necessary for the contracting agency to determine the scope of the unauthorized use; and (c)

provide full cooperation and access to information necessary for the contracting agency and the Contractor to fulfill any notification requirements.

Breach of these terms may be regarded as a material breach of this Contract, such that the Commonwealth may exercise any and all contractual rights and remedies, including without limitation indemnification under Section 11 of the Commonwealth's Terms and Conditions, withholding of payments, contract suspension, or termination. In addition, the Contractor may be subject to applicable statutory or regulatory penalties, including and without limitation, those imposed pursuant to M.G.L. c. 93H and under M.G.L. c. 214, § 3B for violations under M.G.L. c. 66A.

Bidder/Contractor Name: _____.

Bidder/Contractor Authorized Signature: _____.

Print Name and Title of Authorized Signatory: _____.

Date: _____.

This Certification may be signed once and photocopied to be attached to any Commonwealth Contract that does not already contain this Certification Language and shall be interpreted to be incorporated by reference into any applicable contract subject to Executive Order 504 for this Contractor.

Refreshed 3/22/10

Issued 1/1/09

Exhibit A
Executive Order 504 Contractor Certification Form

BIDDER/CONTRACTOR LEGAL NAME:

BIDDER/CONTRACTOR VENDOR/CUSTOMER CODE:

Executive Order 504: For all Contracts involving the Contractor's access to personal information, as defined in M.G.L. c. 93H, and personal data, as defined in M.G.L. c. 66A, owned or controlled by Executive Department agencies, or access to agency systems containing such information or data (herein collectively "personal information"), Contractor certifies under the pains and penalties of perjury that the Contractor (1) has read Commonwealth of Massachusetts [Executive Order 504](#) and agrees to protect any and all personal information; and (2) has reviewed all of the Commonwealth of Massachusetts Information Technology Division's Security Policies available at www.mass.gov/ITD under Policies and Standards.

Notwithstanding any contractual provision to the contrary, in connection with the Contractor's performance under this Contract, for all state agencies in the Executive Department, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established, the Contractor shall:

- (1) obtain a copy, review, and comply with the contracting agency's Information Security Program (ISP) and any pertinent security guidelines, standards and policies; (2) comply with all of the Commonwealth of Massachusetts Information Technology Division's Security Policies ("Security Policies") available at www.mass.gov/ITD under Policies and Standards;
- (2) communicate and enforce the contracting agency's ISP and such Security Policies against all employees (whether such employees are direct or contracted) and subcontractors;
- (3) implement and maintain any other reasonable appropriate security procedures and practices necessary to protect personal information to which the Contractor is given access by the contracting agency from the unauthorized access, destruction, use, modification, disclosure or loss;
- (4) be responsible for the full or partial breach of any of these terms by its employees (whether such employees are direct or contracted) or subcontractors during or after the term of this Contract, and any breach of these terms may be regarded as a material breach of this Contract;
- (5) in the event of any unauthorized access, destruction, use, modification, disclosure or loss of the personal information (collectively referred to as the "unauthorized use"): (a) immediately notify the contracting agency if the Contractor becomes aware of the unauthorized use; (b) provide full cooperation and access to information necessary for the contracting agency to determine the scope of the unauthorized use; and (c) provide full cooperation and access to information necessary for the contracting agency and the Contractor to fulfill any notification requirements.

Breach of these terms may be regarded as a material breach of this Contract, such that the Commonwealth may exercise any and all contractual rights and remedies, including without limitation indemnification under Section 11 of the Commonwealth's Terms and Conditions, withholding of payments, contract suspension, or termination. In addition, the Contractor may be subject to applicable statutory or regulatory penalties, including and without limitation, those imposed pursuant to M.G.L. c. 93H and under M.G.L. c. 214, § 3B for violations under M.G.L. c. 66A.

Bidder/Contractor Name: _____.

Bidder/Contractor Authorized Signature: _____.

Print Name and Title of Authorized Signatory: _____.

Date: _____.

This Certification may be signed once and photocopied to be attached to any Commonwealth Contract that does not already contain this Certification Language and shall be interpreted to be incorporated by reference into any applicable contract subject to Executive Order 504 for this Contractor.



COMMONWEALTH OF MASSACHUSETTS
FORM FOR SUBCONTRACT - M.G.L. c. 149, s. 44F

THIS AGREEMENT made this _____ day of _____ 20____, by and between

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

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

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

1. The Subcontractor agrees to furnish all labor and materials required for the completion of all work specified in Section No. _____ of the Specifications for _____

(Name of Sub-trade)

and the Plans referred to therein and addenda No. _____, _____, _____ and _____ for the _____

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

(Name of Designer or Engineer)

for the sum of _____ (\$_____)

and the 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) _____, _____, _____, _____, _____, _____.

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

(Awarding Authority)

called the "Awarding Authority", except to the extent that provisions contained herein are by their terms or by law applicable only to the Contractor.

(b) The Contractor agrees to be bound to the Subcontractor by the terms of the hereinbefore described documents and to assume to the Subcontractor all the obligations and responsibilities that the Awarding Authority by the terms of the hereinbefore described documents assumes to the Contractor, except to the extent that provisions contained therein are by their terms or by law applicable only to the Awarding Authority.

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

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

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

5. This agreement is contingent upon the execution of a general Contract between the Contractor and the Awarding Authority for the complete work.

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: _____

(City and State)

THIS FORM MAY BE REPRODUCED



BID PACKAGE

PART III

GENERAL CONDITIONS OF THE CONTRACT

General Conditions of the Contract

**Appendix A: -- Equal Employment Opportunity, Non-Discrimination
and Affirmative Action Program**

**Appendix B: -- Goals for Participation by Minority Business Enterprises
and Women Business Enterprises**

Appendix C: -- Commonly Used Forms

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Instructions

Monthly Requisition Breakdown (DCAM Form 55)

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Modifications (DCAM Form 13)

Daily Time and Material Report for Change Orders

Request and Agreement for a Change in the Plans,
Specifications and/or Contract (DCAM Form 5)

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Contractor's Weekly Workforce Report
Minorities/Women in Contractor's Weekly Workforce
Report
Weekly Payroll Report Form and Statement of Compliance
Quarterly Projected Workforce Table
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Instructions
Certificate of Completion by Minority/Women Business
Enterprise
Form for Transfer of Title (Work Not Incorporated, DCAM
Form 16)
Certificate of Agency Use and Occupancy –E-1
Certificate of Final Inspection, Release and Acceptance –
E-2



**COMMONWEALTH OF MASSACHUSETTS STANDARD
VERTICAL CONSTRUCTION CONTRACT For Projects
over \$100,000 Subject to M.G.L. c. 149, s. 44A-F**

GENERAL CONDITIONS OF THE CONTRACT

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Daily Time and Material Report for Change Orders
Request and Agreement for a Change in the Plans, Specifications and/or Contract (DCAMM Form 5)
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Contractors Weekly Workforce Report
Contractors Workforce Employee Set Up Form
Weekly Payroll Report Form and Statement of Compliance
Quarterly Projected Workforce Table
Certification of Payment by Contractor to MBE/WBE and Instructions
Certificate of Completion by Minority/Women Business Enterprise Form for Transfer of Title (Work Not Incorporated, DCAMM Form 16)
Certificate of Agency Use and Occupancy -E-1
Certificate of Final Inspection, Release and Acceptance - E-2

ARTICLE I: DEFINITION OF TERMS

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

Advertisement: The Advertisement or Notice Inviting Bids or Proposals for the Work identified in Article 6 of the Owner - Contractor Agreement.

Approval: (or Approved): An approval in writing signed by the authorized signatory of the Awarding Authority.

Architect: The architect identified as the Designer in Article 1 of the *Owner - Contractor Agreement*.

As directed (As permitted, as required, as determined or words of like effect):

The direction, permission, requirement or determination of the Designer or the Awarding Authority. Similarly, *approved, acceptable, satisfactory* or words of like import shall mean approved by or acceptable or satisfactory to the Designer, except as may be otherwise determined by the Awarding Authority.

Awarding Authority: The public agency awarding and administering this Contract identified as the Awarding Authority in the Owner - Contractor Agreement. Where the Awarding Authority is an agency of the Commonwealth, references to the Awarding Authority shall also include the Commonwealth and its agencies.

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

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

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

Contract: The Contract formed by the Contract Documents as defined in Article 6 of the Owner - Contractor Agreement.

Contract Documents: The documents listed in Article 6 of the Owner - Contractor Agreement.

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

Contract Price: The Contract Price stated in Article 3 of the Owner - Contractor Agreement which is the total sum owed to the Contractor for all of the Work.

DCAMM or DCAM: The Division of Capital Asset Management and Maintenance of the Commonwealth of Massachusetts.

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

Dispute Review Board: A panel of three experienced impartial reviewers organized and agreed upon by the Owner and Contractor. The Board members are provided with plans and specifications, become familiar with project procedures and participants, meet on the job site regularly to encourage the resolution of disputes at the job level and renders non-binding recommendations on the resolution of the dispute.

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

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

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

General Bid: The completed bid form submitted by the Contractor in accordance with the requirements of M.G.L. c. 149.

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

Neutral: An impartial third party not having an interest in the Owner, the Designer, the Contractor or the Project.

Notice to Proceed: The written notice provided by the Awarding Authority to the Contractor which authorizes the Contractor to commence the Work as of a date specified therein, from which date the time of completion specified in Article 2 of the Owner - Contractor Agreement is measured.

Or equal (or words of like import): Equal in the opinion of the Awarding Authority determined pursuant to the provisions of M.G.L. c.30, s. 39M and the provisions of these General Conditions of the Contract.

Owner: The Commonwealth of Massachusetts or political subdivision thereof, authority, or other instrumentality that will own the Work.

Plan(s): Drawing(s).

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

Progress Schedule: The progress schedule Approved by the Designer and the Awarding Authority in accordance with Article VI of these General Conditions of the Contract.

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

Project Manager: The Awarding Authority's representative assigned to the Project.

Punch List: A list of items determined by the Awarding Authority to be minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work for its intended purpose.

Resident Engineer: The on-Site representative of the Awarding Authority.

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

Schedule of Values: The schedule Approved by the Awarding Authority pursuant to Article VIII of these General Conditions of the Contract which allocates the Contract Price to the various portions of the Work and is used as a basis for payments to the Contractor.

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

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

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

Subcontractor: Person or entity with whom the Contractor contracts in order to perform the Work, except as otherwise specifically provided or required herein or by Law.

Substantial Completion: For work subject to M.G.L. c. 30 s. 39K, "substantial completion" shall occur when (1) the Contractor fully completes the Work or substantially completes the Work so that the value of the Work remaining to be done is, in the estimate of the Awarding Authority, less than one percent of the original contract price, or (2) the Contractor substantially completes the work and the Awarding Authority takes possession for occupancy, whichever occurs first. For work subject to M.G.L. c. 30 s. 39G "substantial completion" shall mean either that the work required by the Contract has been fully completed, completed except for work having a Contract Price of less than one percent of the then adjusted total Contract Price, or substantially all of the Work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work.

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

User Agency: The department, county, commission, board, agency or other instrumentality of the Commonwealth of Massachusetts or political subdivision thereof which operates or which will operate the facility at which the Work is undertaken or which comprises the completed Work.

Work: The Work defined in Article 1 of the Owner - Contractor Agreement, Article II, Section 2 of these General Conditions of the Contract and otherwise in the Contract Documents.

Working Hours: 7:00 a.m. to 5:00 p.m., but not more than eight hours per day, Monday through Friday, unless otherwise specified by applicable Laws.

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

ARTICLE II: EXECUTION OF THE CONTRACT, SCOPE OF WORK, INTERPRETATION OF CONTRACT DOCUMENTS

1. Execution.

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

2. Scope of Work.

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

3. Interpretation.

A. The Plans and Specifications and other Contract Documents are to be considered together and are intended to be mutually complementary, so that any work shown on the Plans though not specified in the Specifications, and any work specified in the Specifications though not shown on the Plans, is to be executed by the Contractor as a part of this Contract.

B. All things that in the opinion of the Designer may be reasonably inferred from the Plans, Specifications and other Contract Documents are to be executed by the

Contractor. The Designer shall determine whether the detail Plans conform to the general Plans and Contract Documents, except as may be otherwise determined by the Awarding Authority.

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

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

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

- First Priority: Contract Modifications
- Second Priority: Owner - Contractor Agreement
- Third Priority: General Conditions of the Contract
- Fourth Priority: Drawings -- Schedules take precedence over enlarged detail Drawings, and enlarged Detail Drawings take precedence over reduced scale Drawings; figured dimensions shall prevail over scale.
- Fifth Priority: Specifications

4. Distribution of Work.

The distribution of the Work is intended to be described under the appropriate trades and, except for filed sub-bid work, may be redistributed, except as directed herein, provided that such redistribution shall cause no controversy among the trades and no delay in the progress of the Work.

5. Contract Price.

The Contract Price constitutes full compensation to the Contractor for everything to be performed and furnished in connection with the Work and for all damages arising out of the performance of the Work and/or the action of the elements, and constitutes the maximum compensation regardless of any difficulty incurred by the Contractor in connection with the Work or in consequence of any suspension or discontinuance of the Work.

ARTICLE III: CONTROL OF WORK / ADMINISTRATION OF THE CONTRACT

1. Designer.

Notwithstanding anything to the contrary expressed or implied in this Contract, any of the powers, rights, and duties of the Designer may be exercised by the Awarding Authority, provided that the Awarding Authority shall be under no obligation to do so. The Awarding Authority may rely on the Designer for the performance and exercise of its rights and obligations hereunder and shall be presumed to so rely on the Designer in the absence of an explicit written assumption by the Awarding Authority of any such rights and obligations, except that any Approval required to be obtained from the Awarding Authority hereunder shall not be valid without the signature of the Awarding Authority. The Awarding Authority may explicitly overrule in writing any action, determination or decision of the Designer should the Awarding Authority choose to do so, except to the extent that the same would violate applicable law. Subject to the foregoing, the Designer shall be responsible for the general administration of the Contract and shall perform the duties and exercise the rights herein conferred on the Designer. Except as otherwise specifically provided herein, the Designer shall decide all questions which may arise as to the conduct, quantity, quality, equality, acceptability, fitness, and rate of progress of the several kinds of work and materials to be performed and furnished under this Contract, and shall decide all questions which may arise as to the interpretation of the Plans and

Specifications and as to the fulfillment of this Contract on the part of the Contractor. 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 Awarding Authority may appoint another person to act as Designer for the purposes of this Contract. The Awarding Authority shall give written notice to the Contractor of any such appointment.

2. Right of Access to Work.

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

3. Inspection No Waiver.

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

ARTICLE IV: GENERAL PERFORMANCE OBLIGATIONS OF THE CONTRACTOR

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

1. Review of Contract Documents and Field Conditions.

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

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

2. Supervision and Construction Procedures; Coordination; Cutting, and Patching.

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

B. The 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. The Contractor shall guarantee to each of its Subcontractors all dimensions which they may require for the fitting of their work to all surrounding work.

C. All necessary cutting, coring, drilling, grouting, and patching required to fit together the several parts of the Work shall be done by the Contractor, except as may be specifically noted otherwise under any particular filed sub-bid section of the Specifications.

D. The Contractor shall be responsible to the Awarding Authority for the acts and omissions of the Contractor's employees, agents and Subcontractors, and their agents and respective contractors employees, and other persons performing portions of the Work or supplying materials therefor.

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

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

G. Unless otherwise required by the Supplementary General Conditions or the Plans and Specifications, or directed in writing by the Designer, Work shall be performed during regular Working Hours. However, if the Contractor desires to carry on the Work outside of regular Working Hours or on Saturdays, Sundays, or Massachusetts or federal holidays then the Contractor shall allow ample time to allow satisfactory arrangements to be made for inspecting Work in progress and shall bear the costs of such inspection. The Awarding Authority shall bill the Contractor directly for such costs.

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

3. Superintendent.

A. The Contractor shall employ a Superintendent whose appointment shall be subject to the Approval of the Awarding Authority. The Superintendent shall be in attendance at the Site full-time during the performance of the Work. The Superintendent shall represent the Contractor. Communications given to and from the Superintendent shall be deemed given to and from the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed upon written request in each case. The Superintendent shall attend each job meeting. The Superintendent shall be responsible for coordinating all of the Work of the Contractor and the Subcontractors.

B. The Superintendent shall be a competent employee regularly employed by the Contractor. The Superintendent shall be licensed in accordance with the Building Code and shall have satisfactorily performed similar duties on previous construction projects similar in type, complexity and scale to the Project. The Superintendent's resume shall be submitted to the Awarding Authority prior to commencement of construction together with such other information as the Awarding Authority may reasonably require in order to determine whether or not to Approve of his or her appointment. Any change in the Superintendent shall require the prior consent of the Awarding Authority. The Contractor shall establish an emergency telephone line by which the Awarding Authority, the Designer, or their respective agents may contact the Superintendent during non-working hours.

4. Labor.

A. The Contractor shall employ only competent workers. The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall certify and insure 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 the Contractor and each of its subcontractors and others working on the Project shall furnish documentation of successful completion of said course by employees working with the first certified payroll report for each employee. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. Whenever the Designer shall notify the Contractor in writing that any worker is, in the Designer's opinion, incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such employee shall be discharged from the Work and shall not again be employed on the Project except with the consent of the Designer.

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

C. The Contractor shall procure materials from such sources and shall manage its own forces and the forces of its Subcontractors and any sub-subcontractors in such a manner as will result in harmonious labor relations on the Project Site. If union and nonunion workers are employed to perform any part of the Work, the Contractor shall establish and maintain separate entrances to the Site for the use of union and nonunion workers. The Contractor shall cause persons to be employed in the Work who will work in harmony with others so employed. Should the Work be stopped or materially delayed in the Awarding Authority's reasonable judgment due to a labor dispute, the Awarding Authority shall have the right to require the Contractor to employ substitutes acceptable to the Awarding Authority.

5. Notices and Permits.

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

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

C. Except as otherwise specified in this Contract, it is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable Laws. However, if the Contractor observes that portions of the Contract Documents are at variance with the requirements of Laws, the Contractor shall promptly notify the Designer and Awarding Authority in writing, and necessary changes shall be accomplished by an appropriate Contract Modification.

D. If the Contractor performs Work knowing it to be contrary to Laws without giving such notice to the Designer and Awarding Authority, the Contractor shall bear full responsibility for such Work and all costs attributable thereto, including, without limitation, corrections to the Work.

6. Lines, Marks etc.

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

7. Excavation.

The Contractor shall 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, or if any is removed, filling solid the spaces left thereby.

8. Dewatering/Hoisting/Staging.

The Contractor shall provide pumping, drainage, and disposal of all water and other flows so that no puddle, nuisance, or damage will be caused by water or flooding. The Contractor shall provide all hoisting equipment and machinery required for the proper execution of the Work. The Contractor shall provide all exterior and interior staging required to be over eight feet in height, except as may be otherwise provided in the Contract Documents.

9. Corrections to the Work; Inspection No Bar to Subsequent Corrections. The Designer's inspection of the Work shall not relieve the Contractor of its responsibilities to fulfill the Contract obligations. Defective work may be rejected by the Designer whether or not such work and/or materials have been previously overlooked or misjudged by the Designer and accepted for payment. If the Work or any part thereof shall be found defective at any time before the Final Acceptance of the whole Work, the Contractor shall forthwith cease the performance of any defective work in progress and, whether or not such work is still in progress, shall forthwith correct such defect in a manner satisfactory to the Designer. If any material brought upon the Site for use in the

Work, or selected for the same, shall be rejected by the Designer as unsuitable or not in conformity with the Contract Documents, or as damaged by casualty or deteriorated due to improper storage at the Site or to any other factor, the Contractor shall forthwith remove such materials from the Site. The Contractor shall pay for the cost of making good all work or property of other contractors or of the Owner destroyed or damaged by such removal or replacement; repair any injury, defect, omission or mistake in the Work as soon as it is discovered; finish and immediately make good any defect, omission or mistake in the Work; and complete and leave the Work in perfect condition.

10. Sanitary Facilities.

The Contractor shall provide and maintain sanitary facilities for all persons employed on the Work, beginning with the first worker at the Site. Said facilities shall meet the following requirements unless otherwise specified in the Supplementary General Conditions or Specifications.

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

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

(**Note:** If existing sanitary facilities at the Site are to be used by the Contractor, this requirement will be modified accordingly in the Supplementary General Conditions or Specifications.)

11. Temporary Offices.

A. Except as otherwise specified in the Supplementary General Conditions or Specifications, the Contractor shall erect the following temporary offices near the Site as directed by the Designer and adequately furnish and maintain them in a clean, orderly condition:

(1) A Contractor's field office at which Contractor's authorized representative shall be present at all times while work is in progress. Instructions, notices, and other communications delivered there by the Designer or the Awarding Authority shall be deemed delivered to the Contractor. The Contractor shall provide a separate conference room space with a conference table and chairs sufficient to accommodate 12 persons at one time.

(2) Office for the Resident Engineer, either a separate building or trailer. Such office shall be in close proximity to the Contractor's field office, shall be at least 475 square feet in area, and shall be equipped with partitions to separate it from public access, electric lights, heat, air conditioning, window screens, secure locking devices, and a toilet room with a working chemical toilet. Such office shall be equipped with the following furniture and equipment in good condition: 2 lockable steel desks, word processor, 2 swivel chairs, two stools, 2 metal plan racks, plan table at least 32 by 84 inches, 2 metal filing cabinets with locks, 12 feet of 10 inch deep shelving, one accurate Fahrenheit thermometer, one electric water cooler with disposable cups and water supply service, one hard hat for each project representative and 6 visitor hard hats, one dry plain paper copy machine with a legal and standard paper tray, and one calculator with paper print out, all of which shall become the property of the Contractor at the conclusion of the Work. (**Note:** If office space can be assigned in existing buildings at the Project Site, this requirement will be modified accordingly in the Supplementary General Conditions or Specifications.)

B. The Contractor shall relocate the Resident Engineer's trailer at no additional cost to the Owner if the need for relocation arises as determined by the Designer.

12. Contract Documents and Samples at the Site.

A reasonable number of sets of Contract Documents will be furnished to the Contractor by the Awarding Authority immediately after signing of the Contract, one of which shall be maintained at the Site for reference by authorized representatives of the Awarding Authority. The Contractor shall maintain at the Site for the use and information of the Awarding Authority one record copy of the Drawings, Specifications, Addenda, Change Orders, Approved Shop Drawings, Product Data, Samples, updated Progress Schedule, and all other submittals, all in good order and marked currently to record changes and selections made during construction. These shall be available to the

Designer and the Awarding Authority and shall be delivered to the Designer for submittal to the Awarding Authority upon completion of the Work.

13. Telephones.

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

14. Health, Safety, and Accident Prevention

A. In performing the Work, the Contractor shall:

- (1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the U.S. Secretary of Labor by regulation;
- (2) Protect the lives, health, and safety of other persons; and
- (3) Prevent damage to property, materials, supplies, and equipment.

B. For these purposes, the Contractor shall:

- (1) Comply with 84 Stat. 1590, the "Occupational Safety and Health Act of 1970" (OSHA) and with regulations and standards issued by the U.S. Secretary of Labor at 29 CFR Part 1926; and
- (2) Comply with the Trench Safety Law set forth in M.G.L. c. 82A and regulations promulgated by the Departments of Public Safety (DPS) and Occupational Safety (DOS) in 520 CMR 14.00 et. seq.; the CM shall execute a Trench Application and Permit form with the execution of its contract.
- (3) Include the terms of this Section 14 in every subcontract so that such terms will be binding on each subcontractor.
- (4) Designate by notice to the Awarding Authority a responsible member of its organization at the Site whose duties shall include ensuring safety, implementation of Contractor's Safety Plan referenced below and preventing accidents.

C. The Contractor shall maintain an accurate record of exposure data on all accidents incident to the Work resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 CFR Part 1904. Without limiting the foregoing, the Contractor shall submit to the Awarding Authority without delay verbal and written reports of all accidents involving bodily injury or property damage arising in connection with the Work.

D. In any emergency affecting the safety of persons or property the Contractor shall immediately act in the exercise of reasonable judgment to prevent threatened damage, injury, or loss. The Contractor shall immediately notify the Awarding Authority of such emergency.

E. The Contractor shall be responsible for its Subcontractors' compliance with the provisions of this Section 14.

F. Before commencing any portion of the Work the Contractor shall submit a written Project-specific plan for implementing this Section 14. The plan shall include an analysis of the significant hazards to life, limb and property inherent in the performance of the Work and a plan for controlling these hazards..

G. Without limiting the foregoing provisions of this Section 14, the Contractor shall comply with all health and safety Laws applicable to the Work. Without limitation,

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

Compensation and Liability Act, M.G.L. c. 21C, M.G. L. c. 21E, and any other Laws affecting toxic or hazardous materials, solid, special or hazardous waste (collectively "Hazardous Materials Laws). Should the Contractor discover unforeseen materials subject to Hazardous Materials Laws at the Site, the Contractor shall immediately comply with any and all requirements for dealing with such materials and notify all required governmental authorities and the Awarding Authority of such discovery.

(3) The Contractor shall be responsible for the location of all utilities in connection with the Work. Without limiting the foregoing, the Contractor shall comply with Dig-Safe Laws. Dig-Safe is the Utility Underground Plant Damage Prevention System, 331 Montvale Road, Woburn, MA, 01801, 1-888-344-7233. The Contractor shall notify Dig-Safe of contemplated excavation, demolition, or explosive work in public or private ways, and in any utility company right of way or easement, by certified mail, with a copy to Department of Environmental Protection (DEP). This notice shall be given at least 72 hours prior to the work, but not more than sixty days before the work is to be done. Such notice shall state the name of the street or the route number of the way and shall include an accurate description of the location and nature of the proposed work. Dig-Safe is required to respond to the notice within 72 hours of receipt by designating the location of pipes, mains, wires or conduits at the Site. The 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. The Contractor shall provide the Superintendent with current Dig-Safe regulations, and a copy of M.G.L. c. 82, s. 40. Any costs related to the services performed by Dig-Safe shall be borne by the Contractor.

(4) The Contractor shall comply with M.G.L. c. 149, s. 129A, relative to shoring and bracing of trenches.

H. Without limiting the Contractor's responsibilities described above, the Contractor shall take all reasonable precautions for the safety of, and the prevention of injury or damage to (1) all agents and employees and contractors on the Work and all other persons who may be affected thereby including the general public, (2) all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the Site, under the care custody or control of the Contractor or any of its Subcontractors or any contractors directly or indirectly contracting through any of them, and (3) other property at the Site or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of the Work. The Contractor shall promptly remedy all damage or loss to any such property caused in whole or in part by the Contractor, any Subcontractor, or anyone directly or indirectly contracted or employed by any of them or by anyone for whose acts any of them may be liable. Without limiting the foregoing, the Contractor shall:

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

(10) provide adequate fire protection procedures during the use of cutting torches, welding equipment, plumbers' torches and other flame and spark producing apparatus;

(11) take prompt action to correct any dangerous or hazardous conditions.

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

J. The Contractor shall not permit cutting or welding in or immediately adjacent to existing property of the Owner, Awarding Authority or of anyone else without the Awarding Authority's prior Approval in each instance.

15. Debris and Chemical Waste.

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

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

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

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

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

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

may be specified by DCAMM and by the Supplementary General Conditions or the Specifications.

17. Furnishings and Equipment.

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

18. Form for Sub-contract.

The Contractor when subcontracting with sub-bidders filed pursuant to M.G.L. c. 149, s.44F shall use the form for sub-Contract in M.G.L. c. 149, s. 44F(4) (c). The Contractor shall not interpret paragraph 3 of the statutory form of Subcontract to require such sub-bidders to provide insurance with limits higher than the limits that are required by Article XIV of these General Conditions of the Contract assuming that the term "Contractor" refers to the sub-bidder and that the term "Contract Price" refers to the sub-bidder's price stated in paragraph 1 of the statutory form of Subcontract.

19. Sales Tax Exemption and Other Taxes.

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

20. Final Cleaning.

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

21. Maintenance Data.

Subject to such additional requirements as may be provided in the Supplementary General Conditions or Specifications, the Contractor shall compile 3 complete and identical binders of operating and maintenance data for the entire Work. The Contractor shall submit record maintenance data to the Designer for approval, shall submit approved maintenance data to the Awarding Authority, and shall instruct and train the User Agency's personnel in proper inspection and maintenance procedures.

22. Closeout Procedures.

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

23. Risk of Loss.

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

24. LEED Requirements

Contractor understands that, pursuant to Executive Order No. 484, all new construction and renovation projects over 20,000 square feet must, at a minimum, meet a Massachusetts LEED Plus building standard, and that smaller projects must meet the minimum energy performance standards for advanced buildings established by the Commonwealth of Massachusetts Sustainable Design Roundtable. Furthermore, Contractor understands that the Massachusetts LEED Plus standard or a higher LEED standard applies to all projects overseen by the Massachusetts Division of Capital Asset Management and Maintenance, as well as all projects built on state land for use by state agencies. Contractor must document compliance with this executive order and Project LEED certification standards as described in the project specifications.

ARTICLE V: MATERIALS AND EQUIPMENT

1. Materials Generally.

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

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

2. Shop Drawings, Product Data, and Samples.

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

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

C. The Contractor shall review, approve, and submit to the Designer, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Awarding Authority or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents

or which do not comply with the Contract Documents may be returned without action. The Contractor's attention is directed to the provisions of Section 4 of this Article V and to the Specifications.

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

E. The 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.

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

G. The 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 Awarding Authority has given explicit 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 or the Awarding Authority's actions.

H. 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.

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

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

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

3. Tests.

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

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

4. "Or Equal" Submissions.

A. Where products or materials are prescribed by manufacturer name, trade name, or catalog reference, the words "or Approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if in the opinion of the Awarding Authority (a) it is at least equal in quality, durability, appearance, strength and design, (b) it performs at least equally the function imposed in the general design for the Work, and (c) it conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the Specifications. Any structural or mechanical changes made necessary to accommodate products or materials substituted as an "or equal" shall be at the expense of the Contractor. "Approved equal" shall mean an item with respect to which the Awarding Authority shall have

issued a written statement to the Contractor to the effect that the item is, in the Awarding Authority's opinion, equal within the meaning of this paragraph to that prescribed in the Contract Documents.

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

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

D. The Contractor shall save the written calculations, pricing information, and other data that the Contractor used to calculate the General Bid (the "Bid Pricing Materials") for at least six years after the Awarding Authority makes Final Payment under this Contract. No increase in the Contract Price shall be allowed for any material later found to have been improperly rejected as not being equal unless the Contractor can show persuasive evidence that the rejection increased the Contractor's costs over those provided for in the Bid Pricing Materials, net of all savings the Contractor obtained by substituting other "or-equal" items. Without limiting the foregoing, if the Awarding Authority rejects a proposed substitution on the basis that the item is not equal and if after the Contractor complies with the appeal procedures required by law, DCAMM regulation, and by the Contract Documents, the appropriate authority finds that the proposed substitution was equal, the Contract Price may be increased only to the extent that (1) the item that the Contract Documents specifically require costs more than the item later approved as equal, (2) the Bid Pricing Materials prove that the Contractor calculated its bid using the cost of the item later found as equal, (3) any increase is reduced by any cost that the Contractor would have incurred for structural or mechanical changes necessary to accommodate the substitute item, (4) the Contractor shall not be entitled to any adjustment for overhead and profit, (5) any increase must exceed the aggregate amount that the Contractor saved using products or materials that the Awarding Authority approved as equal under this Contract. In calculating the Contractor's aggregate saving under the preceding clause (5), the Contractor shall provide the Awarding Authority with the Bid Pricing Materials and a calculation based on the Bid Pricing Materials that compare the price (stated in the Bid Pricing Materials) of each item replaced with an "or equal" item, with the cost of the approved equal item, specifically describes all costs that Contractor would have incurred making structural or mechanical changes to include within the Work the item later found to have been improperly rejected and copies of all plans, specifications, shop Drawings, and other design documents that the Awarding Authority deems necessary or desirable.

5. Delivery and Storage of Materials; Inspection.

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

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

C. Expenses for inspection of material by the Designer and/or the Awarding Authority personnel including travel, quarters, and subsistence shall be borne by the Contractor requesting the inspection of material stored outside the Commonwealth of Massachusetts as part of the Contract Price. The policy of the Awarding Authority precludes the payment for material stored outside the boundaries of Massachusetts except in extremely limited circumstances with the express written consent of the Awarding Authority. If the Contractor requests an inspection of material stored outside the Commonwealth of Massachusetts, the Awarding Authority will initially pay for all expenses of inspecting the material incurred by the Designer and/or

Awarding Authority's personnel including travel, quarters, and subsistence. The Awarding Authority will then give Contractor an invoice for those costs and the Contractor shall submit a credit Change Order for the amount of those expenses.

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

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

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

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

ARTICLE VI: PROSECUTION AND PROGRESS

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

A. The Contract time shall commence upon the date specified in the Notice to Proceed. The Contractor shall begin Work at the Site within ten days of said date unless otherwise ordered in writing by the Awarding Authority.

B. Within ten days after the Work has commenced, the Contractor shall submit to the Designer and to the Awarding Authority, a progress schedule for the term of the Contract as required by the Contract Documents, showing in detail his proposed progress for the construction of the various parts of the Work and the proposed times for receiving required materials. Upon Approval by the Awarding Authority, said schedule shall constitute the Progress Schedule. The Contractor shall at the end of each month, or more often if required, furnish to the Designer and to the Awarding Authority a schedule meeting the requirements of the Specifications showing the actual progress of the parts of the Work in comparison with the Progress Schedule.

C. Time is of the essence of this Contract. The Work shall be completed within the time specified in Article 2 of the Owner - Contractor Agreement. Should the Contractor require additional time to complete the Work, the Contractor shall document the reasons therefor and submit a written request for an extension of time within 20 days of the occurrence of the event alleged to be the cause of the delay, as provided in this Article and in Article VII of these General Conditions of the Contract. Failure to submit said written request within the time required by the preceding

sentence shall preclude the Contractor from subsequently claiming any time extension due to said delay.

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

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

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

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

A. If liquidated damages are specified in the Owner - Contractor Agreement, the Awarding Authority has determined that its damages as a result of Contractor's failure to complete the Work to the point at which it qualifies for the issuance of a Certificate of Agency Use and Occupancy will be difficult or impracticable to ascertain. Accordingly, if the Work is not completed to such point by the date specified in this Contract, the Contractor shall pay to the Awarding Authority the sum designated as liquidated damages in the Contract for each and every calendar day that the Contractor

is in default in completing the Work to such point. Such moneys shall be paid as liquidated damages, not as a penalty, to cover losses and expenses to the Awarding Authority and/or the User Agency resulting solely from the fact that the Work is not completed on time.

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

C. The Awarding Authority may recover such liquidated damages by deducting the amount thereof from any moneys due or that might become due the Contractor, and if such moneys shall be insufficient to cover the liquidated damages, then the Contractor or the Surety shall pay to the Awarding Authority the amount due.

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

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

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

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

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

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

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

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

4. Use and Occupancy Prior to Final Acceptance.

A. The Contractor agrees to the use and occupancy of the Project or any portion thereof before Final Acceptance of the Work by the Awarding Authority.

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

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

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

5. Certificate of Agency Use and Occupancy.

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

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

(1) Provide Contractor's proposed Punch List containing a statement of the reason for each item listed thereon;

(2) Advise the Awarding Authority of proposed changes in insurance in accordance with the provisions of this Contract, and provide to the Awarding Authority evidence of Contractor's Completed Operations insurance coverage to the extent required by the Contract Documents;

(3) Execute and submit a notarized warranty on a form provided by the Awarding Authority meeting the requirements of Article IX of these General Conditions of the Contract, to commence upon the date of the issuance of the Certificate of Agency Use and Occupancy for the Work or the designated portion thereof, unless otherwise provided in the Certificate of Agency Use and Occupancy;

(4) Submit signed special warranties and warranties of longer than one year as required by the Contract Documents;

(5) Submit signed maintenance agreements for all portions of the Work specified to receive maintenance after the issuance of the Certificate of Agency Use and Occupancy;

(6) Submit all preliminary record Drawings the Awarding Authority and Designer written acknowledgements from appropriate User and documents and framed data in the forms required by the Contract Documents;

(7) Complete all items required to be completed by the Department of Public Safety and obtain a Certificate of Occupancy from the Department of Public Safety (or, if the Awarding Authority is a municipality, the building department having jurisdiction) and similar releases which permit the User Agency and the Awarding Authority full and unrestricted use of the areas claimed to be ready for occupancy;

(8) Deliver specified maintenance stocks of materials, required spare parts, and all special tools furnished by manufacturers to persons designated by the Awarding Authority and obtain written receipts for same;

(9) Make final changes of lock cylinders or cores and advise the Awarding Authority of the change of project security responsibility;

- (10) Complete start-up of systems and instruct User Agency personnel on proper operation and routine maintenance of all systems and equipment; obtain and submit to Agency personnel that start-up and instruction have been completed;
- (11) Remove all remaining temporary facilities that are no longer needed, surplus materials, and debris; (the Contractor shall not remove construction offices and trailers without the prior Approval of the Awarding Authority);
- (12) Submit final utility meter readings and similar information and advise the User Agency and the Awarding Authority of the change of responsibility for utility charges and payments upon the issuance of the Certificate of Agency Use and Occupancy;
- (13) Complete final clean-up of all Work, restoration of damaged finishes, and replacement of all damaged and broken glass not listed on the Contractor's Punch List.
- (14) Complete such other items as may be called for in the Supplementary General Conditions, if any, or in the Specifications.

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

6. Final Acceptance of the Work.

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

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

B. Reinspection; Final Acceptance. After notification from the Contractor that all remaining contract exceptions, omissions and incompleteness have been completed (with the exception of Contractor's continuing warranty, insurance, indemnification, and such other obligations as are intended by the terms of the Contract Documents to extend beyond the date of Final Acceptance), the Awarding Authority and the Designer shall inspect the Work to verify the completion of the same. If the Work is

satisfactory, the Awarding Authority shall prepare a Certificate of Final Acceptance or shall notify Contractor of items which remain to be completed prior to Final Acceptance.

7. One-Year Warranty Repair List and Inspection.

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

ARTICLE VII: CHANGES IN THE WORK

1. Change Orders Generally.

A. No changes in the Work shall be made in absence of a Change Order (sometimes called a "Notice to Proceed") defined in Article I of these General Conditions of the Contract, directing the Contractor to perform such changes. A request for a change in the provisions of this Contract may be submitted to the Awarding Authority by the Contractor, Designer, Project Manager, Resident Engineer or User Agency. The request must be made in writing and in accordance with the provisions of this Contract, Laws, and the procedures of the Awarding Authority.

B. A Change Order may be issued by the Awarding Authority for changes in the Work within the scope of the Contract, including but not limited to, changes in: (1) the Plans and Specifications; (2) the method or manner of performance of the Work; (3) the Owner-furnished facilities, equipment, materials, services or Site; (4) the schedule for performance of the Work.

C. The Contractor shall immediately perform any Change Order work that is ordered by the Awarding Authority.

D. Whenever a Change Order is issued and said Change Order will cause a change in the Contractor's cost, the Contractor or the Awarding Authority may request an equitable adjustment in the Contract Price. A request for such an adjustment shall be in writing and shall be submitted by the party making such claim to the other party before commencement of the pertinent work or as soon thereafter as possible.

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

F. During the negotiation of an equitable adjustment in the Contract Price, the Contractor shall, if requested, provide the Awarding Authority 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. If the Awarding Authority subsequently determines that the data submitted by the Contractor was incomplete, incorrect or not current, the Awarding Authority may exclude such data from consideration under the equitable adjustment request.

2. Methods of Computing Equitable Adjustments.

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

- (1) fixed price basis, provided that the fixed price shall be inclusive of items (a) through (e) below and shall be computed in accordance with those provisions;
- (2) estimated lump sum basis to be adjusted in accordance with Contract unit prices or other agreed upon unit prices provided that the unit prices shall be inclusive of all costs related to such equitable adjustment;
- (3) time and materials basis to be subsequently adjusted on the basis of actual costs (but subject to a predetermined "not to exceed limit") calculated as follows:
 - (a) the direct cost (or credit) for labor at the minimum wage rates established for this Contract pursuant to M.G.L. c. 149, s 26-27H, and the direct cost for material and use of equipment;
 - (b) plus (or minus) the cost of Workmen's Compensation Insurance, Liability Insurance, Federal Social Security and Massachusetts Unemployment Compensation, or as an alternative the Contractor may elect to use a flat 30% of the total labor rate computed in accordance with subparagraph (a) above;
 - (c) plus an allowance equal to 20% of the amount of (a) above for overhead, superintendence and profit; (In the case of Item 1 work, which is the work of the Contractor and all his non-filed Subcontractors, said 20% allowance shall be paid to the Contractor and the Contractor and said non-filed Subcontractors shall agree upon the distribution of this amount as a matter of contract between them. In the case of Item 2 work, which is work performed by a Subcontractor filed pursuant to M.G.L. c. 149, s. 44F, said 20% allowance shall be paid to the filed Subcontractor, it being understood that this provision does not apply to other Subcontractors including sub-Subcontractors listed under paragraph E of the form for sub-Bid);
 - (d) plus, for work performed by a Subcontractor filed pursuant to M.G.L. c. 149, s. 44F, an additional allowance equal to 7% of the sum of (a) through (c) above as full compensation to the Contractor for processing forms and assuming full responsibility for the faithful performance of such work by said filed Subcontractor(s), provided that there shall be no additional allowance to a General Contractor if the General Contractor self performs the subcontract work pursuant to M.G.L. c. 149, s. 44F(5).
 - (e) plus (or minus) the actual direct additional premium costs and expenses incurred as a result of collective bargaining agreements or other agreements between organized labor and employers, and plus (or minus) the actual direct premium cost of payment and performance bonds required of Contractor and filed Subcontractors for this Contract.
- (4) Contractor and Subcontractors are required to anticipate annual updated prevailing wage schedules in accordance with G.L. c149, §27 and shall not be entitled to claim additional compensation for base bid contract work due to updated prevailing wage schedules.

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

C. Statutory Contract adjustments made under the provisions of M.G.L. c. 149, s.44F shall not be considered Change Orders and shall not entitle the Contractor to any adjustments for overhead, profit, and superintendence, although the Awarding Authority may require that such Contract adjustments be processed on standard Change Order and equitable adjustment forms.

3. Work Performed Under Protest.

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

(1) If the Contractor claims compensation for a change in the Work that is not deemed by the Project Manager to be a change or to warrant additional compensation as claimed by the Contractor, the Contractor shall on or before the first working day following the commencement of any such work or the sustaining of any such damage submit to the Designer, Resident Engineer and the Awarding Authority a written statement of the nature of such work or claim. The Contractor shall not be entitled to additional compensation for any work performed or damage sustained for which written notice is not given within the time limit specified in the preceding sentence, even though similar in character to work or damage with respect to which notice is timely given.

(2) On or before the second working day after the commencement of such work or the sustaining of such damage, and daily thereafter, the Contractor shall file to the extent possible with the Resident Engineer, the Designer, and the Awarding Authority, itemized statements of the details and costs of such work performed or damage sustained. The Contractor shall use the DCAMM Daily Time and Materials Report found in DCAMM Form 13 to record all labor and material used. If the Contractor shall fail to make such statements to the extent possible, then the Contractor shall not be entitled to additional compensation for any such work or damages.

4. False Claims, Statutory Provisions Regarding Changes.

A. Criminal Penalties: The Contractor's attention is directed to M.G.L. c. 30, s. 39I which provides criminal penalties for unauthorized deviations from the Plans and Specifications, and to M.G.L. c. 30, s. 39J and M.G.L. c. 7C, s. 17-21. The Contractor's attention is also directed to M.G.L. 266, s. 67B which provides criminal penalties for false claims by Contractor under this Contract:

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

B. Differing Site Conditions (M.G.L. c. 30, s. 39N): *"If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the Site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing Site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."*

C. Timely Decision By Awarding Authority(M.G.L. c. 30, s. 39P): *"Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission*

written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made."

D. Change Order / Contract Interpretation Appeal Procedure (M.G.L. c. 30, s. 39Q):
The following provisions apply to every contract awarded by any state agency as defined by M.G.L. c. 7C, s. 1 for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section 39A:

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

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

"(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, s/he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

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

5. Mandatory Mediation.

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

ARTICLE VIII: PAYMENT PROVISIONS

1. Schedule of Values.

Before the first application for payment the Contractor shall submit to the Designer and the Awarding Authority a schedule of values allocated to various portions of the Work in sufficient detail to reflect the various major components of each trade (with filed Subcontractors as well as MBE/WBE noted), including quantities when requested, aggregating the total Contract Price and divided so as to facilitate payments for work under each section of the Specifications. The schedule shall be prepared in such form and supported by such data to substantiate its accuracy as the Designer or the Awarding Authority may require. Each item in the schedule shall include its proper share of overhead and profit. When Approved by the Designer and the Awarding Authority, it shall constitute the Schedule of Values and shall be used only as a basis for the Contractor's requests for payments.

2. Payment Liabilities of Contractor.

A. The Contractor shall pay to the Owner all expenses, losses and damages, as determined by the Awarding Authority or the Designer, incurred in consequence of any default, defect, omission or mistake of the Contractor or his employees or Subcontractors or the making good thereof.

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

3. Retention of Moneys by Awarding Authority.

A. The Awarding Authority may keep any moneys which would otherwise be payable at any time hereunder, and apply the same, or so much as may be necessary therefor, to (1) the Owner's expenditures for the Contractor's account, (2) to secure the Awarding Authority's remedies against the Contractor for the Contractor's breach of its obligations under this Contract or the breach of any person performing any part of the Work and (3) the payment of any expenses, losses or damages incurred by the Awarding Authority or any agency of the Commonwealth as a result of the failure of the Contractor to perform its obligations hereunder. The Awarding Authority may retain, until all claims are settled, such moneys as the Awarding Authority estimates to be the fair value of the Awarding Authority's claims against the Contractor, and of all claims for labor performed or furnished and for materials used or employed in or in connection with the Work and for the rental of vehicles, appliances and equipment

employed and for the employment of substitute contractors and labor in connection with the Work filed in accordance with M.G.L. c. 30, s. 39A and s. 39F. The Awarding Authority may make such settlements and apply thereto any moneys retained under this Contract.

B. The Contractor shall each week examine all claims so filed, and if the same are in any respect incorrect or do not correctly show the amount due from the Contractor to the claimant for such labor and materials, the Contractor shall forthwith file with the Awarding Authority a separate written statement of all inaccuracies in each claim and of the correct amount due from the Contractor to each claimant therefor, and shall immediately file a statement of all payments thereafter made to such claimants. Each such statement shall be sworn to and contain a detailed breakdown required by M.G.L. c. 30 s. 39F (d) and (e). Unless such statements are so filed by the Contractor the amount shown by the claims filed shall at the option of the Awarding Authority be conclusively deemed to be the accurate amount due from the Contractor therefor in all accounting with the Awarding Authority. If the moneys retained under this Contract are insufficient to pay the sums found by the Awarding Authority to be due under the claims for labor and materials filed as aforesaid, the Awarding Authority may, at its discretion, pay the same, and the Contractor shall repay to the Awarding Authority all sums paid out. The Awarding Authority may also at its discretion use any moneys retained, due or to become due under this Contract, for the purpose of paying for both labor and materials used or employed in the Work for which claims have not been filed with the Awarding Authority.

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

4. Applications for Payment.

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

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

payable bills with respect to the Work have been paid to date or shall be paid from the proceeds of such periodic estimate. The Contractor's attention is directed to the criminal penalties for false claims referenced in paragraph A above.

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

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

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

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

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

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

"Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the Contract less (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points

above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such periodic estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

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

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

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

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

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

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

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

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

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

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

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

removal of the basis for deduction from direct payments made as provided in parts (i) and (ii) of this subparagraph.

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (5) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest bearing account or accounts in a bank pursuant to subparagraph (6) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the General contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a General contractor amounts which, together with the deposits in interest bearing accounts pursuant to subparagraph (6) are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.

(i) If the subcontractor does not receive payment as provided in subparagraph (1) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (1), the subcontractor may demand direct payment by following the procedure in subparagraph (4) and the general contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g) and (h)."

(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the awarding authority or which are on deposit pursuant to subparagraph (6) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.

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

(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposit as provided in subparagraph (6) by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (6) by a petition in equity in the

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

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

7. Contracts for Public Works Governed by M.G.L. c. 30, s. 39G:

The following statutory provision applies only to contracts for public works governed by M.G.L. c. 30, s. 39G: "Upon substantial completion of the work required by a Contract with the Owner, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges, and other highway structures, sewers and water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the Contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such a list a notice setting forth a reasonable time, which shall not in any event be prior to the Contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

Within sixty-five days after the effective date of a declaration of a substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one percent retainage of that undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payments filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no Contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the Contract by subcontractors, material suppliers or others.

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate than charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five days after the receipt of such list or before the then Contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the Contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the Contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the Contract remain incomplete or unsatisfactory, or that documentation required by the Contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefore, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the Contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the Site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on the estimate of the fair value of its claims against the contractor, a retention for direct payments to

subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the Contract has been completed except for work having a Contract Price of less than one percent of the then adjusted total Contract Price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract”

8. Final Payment; Release of Claims by Contractor.

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

ARTICLE IX. GUARANTEES AND WARRANTIES

1. General Warranty.

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

2. Special Guarantees and Warrantees.

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

B. Guarantees and warranties required in the various sections of the Specifications must be delivered to the Designer before final payment to the Contractor may be made, or in the case of guarantees and warranties which originate with a subcontractor's section of the Work, before final payment for the amount of that subtrade or for the phase of Work to which the guarantee or warranty relates.

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

ARTICLE X: MISCELLANEOUS LEGAL REQUIREMENTS.

1. Contractor to be Informed.

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

2. Compliance with all Laws.

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

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

A ½. Workforce Certification: Certification of Compliance with Workforce Related Legal Requirements. The Contractor shall comply with the following legal requirements for any and all employees to be employed in the Project who are required to be listed in the certified payroll reports for the Project: 1) Federal Department of Homeland Security Requirements in hiring such employees including, but not limited to, the faithful completion of the Federal Department of Homeland Security Form I-9 process by CM; 2) proper classification of individuals employed on the project; 3) all laws concerning workers' compensation insurance coverage, unemployment insurance, social security taxes, and income taxes; and 4) all laws concerning hospitalization and medical benefits that meet the minimum requirements of the Connector Board established in Chapter 176Q of the General Laws. The Contractor shall execute a Workforce Certification form with the execution of its contract. The Contractor shall require each Subcontractor and sub subcontractor working on the Project to execute and provide to Contractor such Workforce Certification form with the execution of each subcontract, and Contractor shall immediately provide a copy to DCAMM. Contractor acknowledges that with the weekly workforce reports that must be submitted on a weekly basis, in the form and format required by DCAMM, including but not limited to, by electronic reporting, Contractor and all subcontractors on the project are required to certify that the Form I-9 process was faithfully completed and that all other legal requirements related to its workforce referenced above were followed for all employees listed on each certified payroll report when submitted. The Contractor and all subcontractors must: comply with the legal requirements of this section; must not knowingly use undocumented workers in connection with the performance of this contract; pursuant to federal requirements must verify the immigration status of all workers assigned to the contract without engaging in unlawful discrimination; and must not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker. Breach of any of the terms of the Workforce Certification legal requirements during the period of the Contract may be regarded as a material breach, subjecting the Contractor and subcontractors to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination. Contractor must require each subcontractor working on the Project to execute and provide to Contractor a

Workforce Certification form with the execution of each subcontract, and Contractor must require each subcontractor to forward a copy of each such Workforce Certification to the Contractor for filing with DCAMM.

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

The Awarding Authority encourages the participation of Service-Disabled Veteran- Owned Business Enterprises (“SDVOBE”) in its construction and design projects pursuant to Chapter 108 of the Acts of 2012 and Executive Order 546. The benchmark for SDVOBE participation on the Project is 3% of the Contract Price. A SDVOBE for purposes of the Commonwealth’s program, is a Service-Disabled Veteran-Owned Small Business (“SDVOSB”) as designated by the federal government pursuant to 15 USC §632, whose status as a SDVOSB can be verified on the U.S. VetBiz Vendor Information Page located at www.VetBiz.gov . SDVOBE’s shall be provided opportunities to participate in the Project and Contractor shall within 30 days of contract execution submit it’s Anticipated Service-Disabled Veteran-Owned Business Enterprise Participation plan to the Awarding Authority’s Compliance Office. Contractor shall report on the amount of SDVOBE participation on the Project on a regular basis, in the form, format and frequency requested by the Awarding Authority, including, but not limited to, by electronic reporting.

C. Prevailing Wages. The Contractor shall comply with M.G.L. c. 149, s. 26-27H. The prevailing wage schedule is found in Exhibit A to the Instructions to Bidders, listing the prevailing minimum wage rates that must be paid to all workers employed in the Work. The Awarding Authority is not responsible for any errors, omissions, or misprints in the said schedule. Such Schedule shall continue to be the minimum rate wages payable to workers employed in the Work throughout the term of this Contract, subject to the exceptions provided in M.G.L c.149, s. 26-27H. The Contractor shall not have any claim for extra compensation from the Owner if the actual wages paid to workers employed in the Work exceeds the rates listed on the schedule or as otherwise provided by law. The Contractor shall cause a copy of said Schedule to be kept in a conspicuous place at the Site during the term of the Contract. If reserve police officers are employed by the Contractor, they shall be paid the prevailing wage of regular police officers. (See M.G.L c.149, s.34B). Mass General Laws c. 149, §27, as amended on August 8, 2008 requires annual updates to prevailing wage schedules for all public construction projects lasting longer than one year. The Contractor is required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The Contractor and all Subcontractors are required to anticipate such annual updated prevailing wage schedules and neither the Contractor nor any Subcontractors shall be entitled to claim additional compensation for base contract work due to updated prevailing wage schedules.

D. Payroll Records and Statement of Compliance. The Contractor shall comply and shall cause its Subcontractors to comply with Massachusetts General Law c. 149, s. 27B, which requires that a true and accurate record be kept of all persons employed on the a project for which the prevailing wage rates have been provided. The Contractor and all Subcontractors shall keep these records and preserve them for a period of three years from the date of completion of the Contract. Such records shall be open to inspection by any authorized representative of the Owner at any reasonable time, and as often as may be necessary. The Contractor shall, and shall cause its subcontractors to, submit weekly copies of their weekly payroll records to the Awarding Authority. In addition, the Contractor and each Subcontractor shall furnish to the Executive Department of Labor within fifteen days after completion of its portion of the Work a signed statement in the form required by the Awarding Authority.

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

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

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

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

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

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

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

undersigned; or which directly or indirectly owns at least 51% of the ownership interests of the undersigned."

(2) The Awarding Authority shall not be obligated to pay the Contractor for the cost of any materials, supplies, or equipment purchased or rented from any individual or entity from whom the Contractor has not previously obtained and delivered to the Awarding Authority the certificate that the previous paragraph requires. The Contractor will immediately terminate its contract with any supplier who breaches the warranty, representation and agreement contained in the previous paragraph.

(3) The Contractor shall include in the Contractor's agreement with any person or entity from whom the Contractor intends to purchase or rent any materials, equipment, machinery, vehicles or supplies for or in connection with the Work, (a) a notice that this Contract obligates the Contractor to terminate the supply contract upon discovery of such breach of the sworn certificate delivered under subparagraph (1) and such termination shall be without liability to the Contractor or the Awarding Authority and (b) a provision which states: "The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of the undersigned vendor which pertain to the performance and requirements of this agreement to provide materials of any nature to the undersigned contractor in connection with State Project No. (insert project number)."

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

M. Northern Ireland - M.G.L. c. 7 § 22C. Pursuant to G.L. c. 7 s. 22C for state agencies, state authorities, the House of Representatives or the state Senate, the Contractor certifies that it does not employ ten or more employees in an office or other facility in Northern Ireland and if the Contractor employs ten or more employees in an office or other facility located in Northern Ireland the Contractor certifies that it does not discriminate in employment, compensation, or the terms, conditions and privileges of employment on account of religious or political belief; and it promotes religious tolerance within the work place, and the eradication of any manifestations of religious and other illegal discrimination; and the Contractor is not engaged in the manufacture, distribution or sale of firearms, munitions, including rubber or plastic bullets, tear gas, armored vehicles or military aircraft for use or deployment in any activity in Northern Ireland.

ARTICLE XI: CONTRACTOR'S ACCOUNTING METHOD REQUIREMENTS (M.G.L. c. 30, s. 39R)

1. Definitions.

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

--"Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a Contract pursuant to M.G.L. c. 30, s. 39M, M.G.L. c. 149, s. 44A-J, and M.G.L. c. 7, s. 30B-P.

--"Contract" means any Contract awarded or executed pursuant to M.G.L. c. 30, s. 39M, M.G.L. c. 149, s.44A-J, and M.G.L. c. 7, s. 30B-P, which is for an amount or estimated amount greater than one hundred thousand dollars.

--"Independent Certified Public Account" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office and who is in fact independent. In determining whether an accountant is independent with aspect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's

independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

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

--"Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

or other person or persons primarily responsible for the financial and operational policies and practices of the Contractor.

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

2. Record Keeping.

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

B. Until the expiration of six years after final payment, the Inspector General, DCAMM, and the Awarding Authority shall have the right to examine any books, documents, papers or records of the Contractor and Subcontractors that directly pertain to, and involve transactions relating to the Contractor and Subcontractors.

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

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

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

3. Statement of Management Controls.

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

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

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

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

4. Annual Financial Statement.

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

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

5. Bid Pricing Materials.

The Contractor shall save the written calculations, pricing information, and other data that the Contractor used to calculate the bid that induced the Awarding Authority to enter into this Contract (the "Bid Pricing Materials") for at least six years after the Awarding Authority makes final payment under this Contract.

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

This Contract includes the provisions of the Awarding Authority's "Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program" attached as Appendix A to these General Conditions of the Contract and incorporated herein by reference.

ARTICLE XIII: GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES

This Contract includes the provisions of the Awarding Authority's program relating to Goals for Participation by Minority Business Enterprises and Women Business Enterprises attached as Appendix B to these General Conditions of the Contract and incorporated herein by reference.

ARTICLE XIV: 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 Awarding Authority, or otherwise acceptable to the Awarding Authority.

C. Contractor shall submit three originals of each certificate of insurance, acceptable to the Awarding Authority, simultaneously with the execution of this Contract. Certificates shall show each type of insurance, insurance company, policy number, amount of insurance, deductibles and/or self-insured retentions, and policy effective and expiration dates. Certificates shall show the Awarding Authority, the Owner and anyone else the Awarding Authority requests as an additional insured as to all policies of liability insurance. Certificates shall specifically note the following:

- that the automobile liability, umbrella liability and pollution liability policies include the Awarding Authority as an additional insured;
- that all policies include the coverage and endorsements in accordance with the terms and conditions as required by this construction contract;
- that the Builders' Risk or Installation Floater is on an all risk basis including earthquake and flood, and includes the Awarding Authority as a named insured or loss payee as their interests may appear; and

- that none of the coverages shall be cancelled, terminated, or materially modified unless and until 30 days prior notice is given in writing to the Awarding Authority. Contractor shall submit updated certificates prior to the expiration of any of the policies referenced in the certificates so that the Awarding Authority shall at all times possess certificates indicating current coverage.

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

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

F. The Contractor is responsible for the payment of any and all deductibles under all of the insurance required below. The Awarding Authority shall not in any instance be responsible for the payment of deductibles, self-insured retentions, or any portion thereof.

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 Exhibit A to the Owner - Contractor Agreement, in which case the Contractor shall provide the additional coverage:

Bodily Injury & Property Damage	\$1,000,000 each occurrence
Products & Completed Operations	\$2,000,000 general aggregate per project
Personal & Advertising Injury	\$1,000,000 annual aggregate
Medical Expenses	\$1,000,000 each occurrence
	\$5,000

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

C. This policy shall include contractual liability coverage.

D. The completed operations coverage shall be maintained for a period of three (3) years after Substantial Completion and acceptance by the Awarding Authority. The Contractor shall provide renewal certificates of insurance to the Awarding Authority as evidence that this coverage is being maintained.

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

F. This policy shall include the Awarding Authority, the Owner and anyone else requested by the Awarding Authority as an additional insured via endorsements CG 20 10 for ongoing operations and CG 20 37 for completed operations. This policy shall be primary and non-contributory with respect to any other insurance available to additional insureds.

G. The policy shall include endorsement CG 24 04, a Waiver of Subrogation in favor of the Awarding Authority and Owner.

3. Automobile 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 Exhibit A to the Owner - Contractor Agreement, in which case the Contractor shall provide the additional coverage:

Bodily Injury & Property Damage	\$1,000,000 combined single limit
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B. The policy shall include a CA 99 48 Broadened Pollution Endorsement. If specified in Exhibit A to the Owner – Contractor Agreement, the Contractor, if hauling contaminants and/or pollutants, must adhere to Sections 29 and 30 of the Motor Carrier Act of 1980, which shall include coverage Form MCS-90.

C. The policy shall name the Awarding Authority and Owner as additional insureds.

D. The policy shall contain a Waiver of Subrogation in favor of the Awarding Authority and Owner.

4. Contractor's Pollution Liability.

The Contractor shall purchase and maintain coverage for bodily injury and property damage resulting from liability arising out of pollution related exposures such as asbestos abatement, lead paint abatement, tank removal, removal of contaminated soil, etc. The insurance policy shall cover the liability of the Contractor during the process of removal, storage, transport and disposal of hazardous waste and contaminated soil and/or asbestos abatement. The policy shall include coverage for on-Site and off-Site bodily injury and loss of, damage to, or loss of use of property, directly or indirectly arising out of the discharge, dispersal, release or escape of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids or gas, waste materials or other irritants, contaminants or pollutants into or upon the land, the atmosphere or any water course or body of water, whether it be gradual or sudden and accidental. The policy shall also include defense and clean-up costs. The Awarding Authority and Owner shall be named as an additional insureds and coverage must be on an occurrence basis. The amount of coverage shall be as follows unless a higher amount is specified in Exhibit A to the Owner - Contractor Agreement, in which case the Contractor shall provide the additional coverage:

Limit of liability	\$1,000,000 per occurrence \$3,000,000 aggregate
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5. 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 Exhibit A to the Owner - Contractor Agreement, 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

B. If specified in Exhibit A to the Owner - Contractor Agreement the policy must be endorsed to cover United States Longshoremen & Harborworkers Act (USLHW), or Maritime Liability.

C. The policy shall contain a Waiver of Subrogation in favor of the Awarding Authority and Owner.

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

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

include transportation and Stored Materials coverage in an amount equal to the value of the stored materials as required in C. below.

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

C. 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 Awarding Authority.

D. The policy or policies shall specifically state that they are for the benefit of and payable to the Awarding Authority, 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 Awarding Authority, the Owner, the Contractor, and Subcontractors of any tier as named insureds.

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

F. Coverage shall include permission for temporary occupancy and a Waiver of Subrogation in favor of the Awarding Authority and Owner

G. Coverage shall be maintained until final acceptance by the Awarding Authority and Owner of the Contract and final payment has been made.

H. 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.

7. 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 unless a higher amount is specified in Exhibit A to the Owner - Contractor Agreement, in which case the Contractor shall provide the higher amount:

<u>Contract Price:</u>	<u>Limit of Liability:</u>
Under \$1,000,000	\$2,000,000 per occurrence
\$1,000,001 -- \$5,000,000	\$5,000,000 per occurrence
\$5,000,001-- \$10,000,000	\$10,000,000 per occurrence
\$10,000,001 and over	\$25,000,000 per occurrence

8. Additional Types of Insurance.

The Contractor shall provide such other types of insurance as may be required by Exhibit A to the Owner - Contractor Agreement.

ARTICLE XV: INDEMNIFICATION

1. Generally.

To the fullest extent permitted by law, the Contractor shall indemnify, defend (with counsel subject to the supervision of the Attorney General of the Commonwealth of Massachusetts as required by M.G.L. c. 12, s. 3) and hold harmless the Owner, Awarding Authority and Designer and their officers, agents, divisions, agencies, employees, representatives, successors and assigns from and against all claims,

damages, losses and expenses, including but not limited to court costs and attorneys' fees, arising out of or resulting from the performance of the Work, including but not limited to those arising or resulting from:

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

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

2. Designer's Actions.

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

3. Survival.

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

ARTICLE XVI: PERFORMANCE AND PAYMENT BONDS

1. Contractor Bonds.

A. The Contractor shall provide performance and payment (labor and materials) bonds in the form provided by the Awarding Authority, executed by a surety licensed by the Commonwealth of Massachusetts Division of Insurance. Each such bond shall be in the amount of the Contract Price.

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

-is adjudged bankrupt or has made a general assignment for the benefit of its creditors;

-has liquidated all assets and/or has made a general assignment for the benefit of its creditors;

-is placed in receivership;

-otherwise petitions a state or federal court for protection from its creditors; or

-allows its license to do business in Massachusetts to lapse or be revoked;

then the Contractor shall, within 21 days of any such action listed above, provide the Awarding Authority with new performance and payment bonds as described in Paragraph A above. Such bonds shall be provided solely at the Contractor's expense.

2. Subcontractor Bonds.

A. If the Contractor provided in its General Bid that any or all filed subcontractors shall provide the Contractor with payment and performance bonds for the full amount of their respective Subcontracts, then the costs for said bonds shall be the responsibility of the Contractor.

B. If the Contractor provided in its General Bid that filed Subcontractors shall provide bonds, and subsequently waives the requirement, the Contractor shall give the Awarding Authority a written certification that the Contractor understands that if the filed Subcontractor defaults or is terminated, the Contractor shall have full responsibility for all costs and expenses related to said default or termination but shall be entitled to a credit adjustment to the Contract Price in an amount equal to the bond premium Contractor would have paid had Contractor required the filed Subcontractor to provide such bonds.

ARTICLE XVII: TERMINATION OF CONTRACT

1. Termination for Cause.

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

- (1)** The Contractor has filed a petition, or a petition has been filed against the Contractor with its consent, under any federal or state law concerning bankruptcy, reorganization, insolvency or relief from creditors, or if such a petition is filed against the Contractor without its consent and is not dismissed within sixty (60) days; or if the Contractor is generally not paying its debts as they become due; or if the Contractor becomes insolvent; or if the Contractor consents to the appointment of a receiver, trustee, liquidate, custodian or the like of the Contractor or of all or any substantial portion of its assets and such appointment or possession is not terminated within sixty (60) days; or if the Contractor makes an assignment for the benefit of creditors;
- (2)** The Contractor refuses or fails, except in cases for which extension of time is provided under this Contract's express terms, to supply enough properly skilled workers or proper materials to perform its obligations under this Contract, or the Designer has determined that the rate of progress required for the timely completion of the Work is not being met;
- (3)** The Contractor fails to make prompt payment to Subcontractors or for materials, equipment, or labor;
- (4)** All or a part of the Work has been abandoned;
- (5)** The Contractor has sublet or assigned all or any portion of the Work, the Contract, or claims thereunder, without the prior written consent of the Owner, except as expressly permitted in this Contract;
- (6)** The Contractor has failed to comply with Laws;
- (7)** The Contractor fails to maintain, or provide to the Awarding Authority evidence of the insurance or bonds required by this Contract, or
- (8)** The Contractor has failed to prosecute the Work or any portion thereof to the standards required under this Contract or has otherwise breached any material provision of this Contract.

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

- (1)** hold the Contractor and its sureties liable in damages for a breach of Contract;
- (2)** notify the Contractor to discontinue all work, or any part thereof, and the Contractor shall discontinue all work, or any part thereof, as the Owner may designate;
- (3)** complete the Work, or any part thereof, and charge the expense of completing the Work or part thereof, to the Contractor;
- (4)** require the surety or sureties to complete the Work and perform all of the Contractor's obligations under this Contract.

If the Awarding Authority elects to complete all or any portion of the Work as specified in (3) above, it may take possession of all materials, equipment, tools, machinery, implements at or near the Site owned by the Contractor and finish the Work at the Contractor's expense by whatever means the Awarding Authority may deem expedient; and the Contractor shall cooperate at its expense in the orderly transfer of the same to a new contractor or to the Awarding Authority as directed by the Awarding Authority. In such case the Awarding Authority shall not make any further payments to the Contractor

until the Work is completely finished. The Owner shall not be liable for any depreciation, loss or damage to said materials, machinery, implements or tools during said use and the Contractor shall be solely responsible for their removal from the Site after the Owner has no further use for them. Unless so removed within fifteen days after notice to the Contractor to do so, they may be sold at public auction, after publication of notice thereof at least twice in any newspaper published in the county where the Work is being performed, and the proceeds credited to the Contractor's account; or they may, at the option of the Awarding Authority, be stored at the Contractor's expense subject to a lien for the storage charges.

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

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

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

2. Termination For Convenience.

A. The Awarding Authority may terminate this Contract for convenience even though the Contractor is not in default by giving notice to the Contractor specifying in said notice the date of termination.

B. In case of such termination without cause, the Contractor shall be paid: (1) all sums due and owing under this Contract through the date of termination, including any retainage withheld to the date of termination, less any amount which the Awarding Authority determines is necessary to correct or complete the Work performed to the date of termination; plus (2) a reasonable sum to cover the expenses which Contractor would not have incurred but for the early termination of the Contract, such as demobilization of the work force, restocking charges, termination fees payable to Subcontractors.

C. The payment provided in paragraph B above shall be considered to fully compensate the Contractor for all claims and expenses and those of any consultants, Subcontractors, and suppliers, directly or indirectly attributable to the termination, including any claims for lost profits.

3. Contractor's Duties Upon Termination For Convenience.

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

ARTICLE XVIII: MISCELLANEOUS PROVISIONS

1. No Assignment by Contractor.

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

any right hereunder by the Awarding Authority as to the qualifications or the responsibility of the Contractor or Subcontractor(s).

2. Non-Appropriation.

If the Awarding Authority is unable to obtain an appropriation of funds sufficient to discharge the Commonwealth's obligations under this Agreement for any fiscal year during the term of this Agreement, the Commonwealth shall not be obligated to make any further payments, and this Agreement may be terminated immediately by either the Commonwealth or the Contractor, provided that the Commonwealth shall make payment to the Contractor for obligations incurred during the period for which funding was included in an annual or supplemental appropriation. Delay by the General Court in enacting an annual or supplemental appropriation bill shall not be grounds for termination of this Agreement pursuant to this Section, unless such annual or supplemental appropriation bill as enacted and signed by the Governor contains insufficient funding for obligations pursuant to this Agreement.

3. Claims by Others Not Valid.

No person other than the Contractor shall acquire any interest in this Contract or claim against the Awarding Authority or Owner hereunder, and no claim by any other person shall be valid except as provided in M.G.L. c. 30, s. 39F of the General Laws.

4. No Personal Liability of Public Officials.

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

5. Severability.

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

6. Choice of Laws.

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

7. Standard Forms.

Unless directed otherwise in writing by the Awarding Authority, Contractor shall use the standard forms in use by the Division of Capital Asset Management and Maintenance appearing in Appendix C to these General Conditions of the Contract.

8. No Waiver of Subsequent Breach.

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

9. Remedies Cumulative.

All remedies of the Awarding Authority provided in this Contract shall be construed as cumulative and may be exercised simultaneously or in any order as determined by the Awarding Authority in its sole discretion. The Awarding Authority shall also be entitled as of right to specific performance and equitable relief including the right to an injunction against any breach of any of the provisions of this Contract

10. Notices.

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

APPENDIX A to General Conditions of the Contract

The following provisions form Article XII of the General Conditions of the Contract where DCAMM is the Awarding Authority.

EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM.

1. Compliance Generally.

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

2. Non-Discrimination and Affirmative Action.

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

B. The Contractor shall comply with the provisions of Executive Order 478, entitled Order Regarding Nondiscrimination, Diversity, Equal Opportunity and Affirmative Action, which prohibits unlawful discrimination based on race, color, age, gender, ethnicity, sexual orientation, religion, creed, ancestry, national origin, disability, veteran's status (including Vietnam-era veterans), or background. Executive Order 478 is herein incorporated by reference and made a part of this Contract.

Pursuant to Executive Order 478 the Contractor and any subcontractors may not engage in discriminatory employment practices; and the Contractor must certify that it is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and commit to purchasing supplies and services from certified minority or women-owned businesses, small businesses, or businesses owned by socially or economically disadvantaged persons or persons with disabilities. These provisions shall be enforced through the contracting agency, the Operational Services Division, and/or the Massachusetts Commission Against Discrimination. Any breach shall be regarded as a material breach of Contract that may subject Contractor to appropriate sanctions. The Contractor shall comply with the provisions of Executive Order No. 246 entitled Revoking and Superseding Executive Orders Numbers 143 and 150, with respect to affirmative action programs for handicapped individuals, which is herein incorporated by reference and made a part of this Contract.

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

D. If the Contractor shall use any subcontractor on any work performed under this Contract, the Contractor shall take affirmative steps to negotiate with qualified minority and women subcontractors. These affirmative steps shall cover both pre-bid

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

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

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

3. Liaison Committee, Reports and Records.

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

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

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

D. A designee of the Awarding Authority and a designee of the Liaison Committee shall each have right to access to the Site.

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

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

4. Sanctions.

A. Whenever the Awarding Authority, the Commission, or the Liaison Committee believes the Contractor or any Subcontractor may not be operating in compliance with the terms of this Article, the Commission shall directly, or through its designated agent, conduct an appropriate investigation, and may confer with the parties, to

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

(1) The recovery by the Awarding Authority from the Contractor of 1/100 of 1% of the Contract award price or \$1,000 whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the Awarding Authority from the Contractor, to be assessed by the Contractor as a back charge against the subcontractor, of 1/10 of 1% of the sub-Contract Price, or \$400 whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;

(2) The suspension of any payment or part thereof due under the Contract until such time as the Contractor or any subcontractor is able to demonstrate his compliance with the terms of the Contract;

(3) The termination or cancellation of the Contract, in whole, or in part, unless the Contractor or any Subcontractor is able to demonstrate within a specified time his compliance with the terms of the contract;

(4) The denial to the Contractor or any subcontractor of the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three years.

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

C. Sanctions recommended by the Commission and enumerated under Section 4 above shall not be imposed by the Awarding Authority except after an adjudicatory proceeding, as that term is used M.G.L. c. 30A, has been conducted. No investigation by the Commission or its agent shall be initiated without prior notice to the Contractor.

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

APPENDIX B to General Conditions of the Contract

The following provisions form Article XIII of the General Conditions of the Contract where DCAMM is the Awarding Authority.

GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES (EXECUTIVE ORDER 390, EXECUTIVE ORDER 478, M.G.L. c. 7C, s. 6)

1. Goals.

A. The goals for minority business enterprise and woman business enterprise participation established for this Contract are as set forth in the Owner - Contractor Agreement.

B. The Contractor and all Subcontractors, sub-subcontractors, and materials suppliers shall comply with all of the terms and conditions of this Article, which include the provisions pertaining to MBE/WBE participation set forth in the Owner - Contractor Agreement in order to meet the MBE/WBE participation goals established for this Contract.

2. MBE/WBE Participation Credit.

A. If the Contractor is itself an MBE or WBE, MBE/WBE participation credit shall be given in an amount equal to the entire Contract Price. If the Contractor is not an MBE or WBE, then MBE/WBE participation credit will be given for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

B. If the Contractor is a joint venture with one or more MBE/WBE joint venturers, MBE/WBE participation credit shall be given to the joint venture as follows:
(1) If the joint venture is certified by SOMBWA as an MBE or WBE, MBE/WBE participation credit shall be given in an amount equal to the entire Contract Price.
(2) If the joint venture is not certified as an MBE or WBE by the Supplier Diversity Office (SDO), MBE/WBE participation credit shall be given to the joint venture for the value of the Work that is performed by the MBE/WBE joint venturer(s), and for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

C. If an MBE/WBE supplies but does not install equipment or materials, MBE/WBE participation credit shall be given only if the MBE/WBE supplier is regularly engaged in sales of equipment or supplies to the construction industry from an established place of business. MBE/WBE participation credit shall be given the full amount of the purchase order only if the MBE/WBE supplier manufactures the goods or substantially alters them before resale. In all other cases, MBE/WBE participation credit shall be given for 10% of the purchase order.

D. MBE participation credit shall be given for the work performed by MBEs only, and WBE participation credit shall be given for the work performed by WBEs only. MBE participation may not be substituted for WBE participation, nor may WBE participation be substituted for MBE participation.

3. Establishing MBE/WBE Status.

A. A minority owned business shall be considered an MBE only if it has been certified as a minority business enterprise by the Supplier Diversity Office ("SDO" formerly SOMWBA).

B. A woman owned business shall be considered a WBE only if it has been certified as a woman business enterprise by SDO.

C. Certification as a disadvantaged business enterprise ("DBE"), certification as an MBE/WBE by any agency other than SDO, or submission of an application to SDO for certification as an MBE/WBE shall not confer MBE/WBE status on a firm for the purposes of this Contract.

4. Subcontracts With MBE/WBEs.

Within thirty (30) days after the award of this Contract, the Contractor shall (i) execute a subcontract with each MBE/WBE Subcontractor which has executed a Letter of Intent Approved by the Awarding Authority, (ii) cause its Subcontractors to

execute a sub-subcontract with each MBE/WBE sub-subcontractor, and (iii) furnish the Awarding Authority with a signed copy of each such subcontract and sub-subcontract.

5. Performance of Contract Work by MBE/WBEs.

A. The Contractor shall not perform with its own organization, or subcontract or assign to any other firm, work designated to be performed by any MBE/WBE in the Letters of Intent or Schedule for MBE/WBE Participation without the prior written Approval of the Awarding Authority, nor shall any MBE/WBE assign or subcontract to any other firm, or permit any other firm to perform any of its MBE/WBE Work without the prior written Approval of the Awarding Authority. Any such unapproved assignment, subcontracting, sub-subcontracting, or performances of BE/WBE Work by others shall be a change in the MBE/WBE Work for the purposes of this Contract. The Awarding Authority WILL NOT APPLY TO THE MBE/WBE PARTICIPATION GOAL(S) ANY SUMS ATTRIBUTABLE TO SUCH UNAPPROVED ASSIGNMENTS, SUB-CONTRACTS, SUB-SUBCONTRACTS, OR PERFORMANCE OF MBE/WBE WORK BY OTHERS.

B. The Contractor shall be responsible for monitoring the performance of MBE/WBE Work to ensure that each scheduled MBE/WBE performs its own MBE/WBE Work with its own workforce.

C. The Contractor and each MBE/WBE shall provide the Awarding Authority with all information and documentation that the Awarding Authority determines is necessary to ascertain whether or not an MBE/WBE has performed its own MBE/WBE Work. At the discretion of the Awarding Authority, failure to submit such documentation to the Awarding Authority shall establish conclusively for the purpose of giving MBE/WBE participation credit under this Contract that such MBE/WBE did not perform such work.

6. Notification of Changes in MBE/WBE Work.

A. If at any time during the performance of the Contract the Contractor determines or has reason to believe that a scheduled MBE/WMBE is unable or unwilling to perform its MBE/WBE Work, or that there has been or will be a change in any MBE/WBE Work, or that the Contractor will be unable to meet the MBE/WBE participation goal(s) for this Contract for any reason, the Contractor shall immediately notify the Awarding Authority Contract Compliance Office in writing of such circumstances.

B. Any notice of a change in MBE/WBE Work pursuant to subparagraph "A" above shall include a revised Schedule for MBE/WBE Participation, and additional or amended Letters of Intent and subcontracts, as the case may be.

7. Actions Required If There is a Reduction in MBE/WBE Participation.

A. In the event there is a change or reduction in any MBE/WBE Work which will result in the Contractor failing to meet the MBE/WBE participation goal(s) for this Contract, other than a reduction in MBE/WBE Work resulting from a Change Order initiated by the Awarding Authority, then the Contractor shall immediately undertake a diligent, good faith effort to make up the shortfall in MBE/WBE participation as follows:

(1) The Contractor shall identify all items of the Work remaining to be performed under the Contract that may be made available for subcontracting to MBE/WBEs. The Contractor shall send a list of such items of work to the Awarding Authority, together with a list of the remaining items of the Work that were not made available to MBE/WBEs and the reason for not making such work available for subcontracting to MBE/WBEs.

(2) The Contractor shall send written notices soliciting proposals to perform the items of the Work that may be made available for subcontracting to MBE/WBEs to all MBE/WBEs qualified to perform such work. The Contractor shall advise the Awarding Authority of (i) each MBE/WBE solicited, and (ii) each MBE/WBE listed in the SDO directory under the applicable trade category who was not solicited and the reasons therefor. The Contractor shall also advise the Awarding Authority of the dates notices were mailed and provide a copy of the written notice(s) sent.

(3) The Contractor shall make reasonable efforts to follow up the written notices sent to MBE/WBEs with telephone calls or personal visits in order to determine with

certainty whether the MBE/WBEs were interested in performing the work. Phone logs or other documentation must be submitted to the Awarding Authority evidencing this effort.

(4) The Contractor shall make reasonable efforts to assist MBE/WBEs that need assistance in obtaining insurance, bonds, or lines of credit in order to perform work under the Contract, and shall provide the Awarding Authority with evidence that such efforts were made.

(5) The Contractor shall provide the Awarding Authority with a statement of the response received from each MBE/WBE solicited, including the reason for rejecting any MBE/WBE who submitted a proposal, if applicable.

(6) The Contractor shall take any additional measures reasonably requested by the Awarding Authority to meet the MBE/WBE participation goal(s) established for this Contract, including, without limitation, placing advertisements in appropriate media and trade association publications announcing the Contractor's interest in obtaining proposals from MBE/WBEs, and/or sending written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the project and of the work available to be subcontracted by the Contractor to MBE/WBEs.

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

8. Suspension of Payment and/or Performance for Noncompliance.

A. If at any time during the performance of this Contract, the Awarding Authority determines or has reason to believe that (1) there has been a change or reduction in any MBE/WBE Work which will result in the Contractor failing to meet the MBE/WBE participation goal(s) for this Contract, other than a reduction in MBE/WBE Work resulting from a change in the Contract work ordered by the Awarding Authority, and (2) the Contractor has failed to comply fully with all of the terms and conditions of paragraphs 1 through 7 above, the Awarding Authority may: (1) suspend payment to the Contractor of an amount up to the full value of the work which was to have been performed by an MBE/WBE pursuant to the Contractor's Schedule for MBE/WBE Participation but which was not so performed, in order to ensure that sufficient Contract funds will be available if liquidated damages are assessed pursuant to paragraph 9, and/or (2) suspend the Contractor's performance of this Contract in whole or in part.

B. The Awarding Authority shall give the Contractor prompt written notice of any action taken pursuant to paragraph A above and shall give the Contractor and any other interested party, including any MBE/WBEs, an opportunity to present evidence to the Awarding Authority that the Contractor is in compliance with the requirements of this Article, or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The Awarding Authority may invite SDO and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken pursuant to this paragraph.

C. Upon a showing that the Contractor is in full compliance with the requirements of this Article, or that the Contractor has met or will meet the MBE/WBE participation goals for this Contract, the Awarding Authority shall release any funds withheld pursuant to clause A(1) above, and lift any suspension of the Contractor's performance under clause A(2) above.

9. Liquidated Damages; Termination.

A. If payment by the Awarding Authority or performance by the Contractor is suspended by the Awarding Authority as provided in paragraph 8 above, the Awarding Authority shall have the following rights and remedies if the Contractor thereafter fails to take all action necessary to bring the Contractor into full compliance with the requirements of this Article, or if full compliance is no longer possible because the default of the Contractor is no longer susceptible to cure, if the Contractor fails to take such other action as may be required by the Awarding Authority to meet the MBE/WBE participation goals set forth in this Contract:

(1) the Awarding Authority may terminate this Contract, and/or

(2) the Awarding Authority may retain from final payment to the Contractor, as liquidated damages, an amount equal to the difference between (x) the total of the MBE/WBE participation goals set forth in this Contract, and (y) the amount of MBE/WBE participation credit given to the Contractor for MBE/WBE Work performed under this Contract as determined by the Awarding Authority, the parties agreeing that the damages for failure to meet the M/BE/WBE participation goals are difficult to determine and that the foregoing amount to be retained by the Awarding Authority represents the parties' best estimate of such damages. Any liquidated damages will be assessed separately for MBE and WBE participation.

B. Before exercising its rights and remedies hereunder, the Awarding Authority may, but the Awarding Authority shall not be obligated to, give the Contractor and any other interested party another opportunity to present evidence to the Awarding Authority that the Contractor is in compliance with the requirements of this Article or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The Awarding Authority may invite SDO and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken hereunder.

10. Reporting Requirements.

The Contractor shall submit to the Awarding Authority all information or documentation that is necessary in the judgment of the Awarding Authority to ascertain whether or not the Contractor has complied with any of the provisions of this Article.

11. Awarding Authority's Right to Waive Provisions of this Article in Whole or In Part.

The Awarding Authority reserves the right to waive any provision or requirement of this Article if the Awarding Authority determines that such waiver is justified and in the public interest. No such waiver shall be effective unless in writing and signed by a representative of the Awarding Authority's Compliance Office or the Office of its General Counsel. No other action or inaction by the Awarding Authority shall be construed as a waiver of any provision of this Article.

APPENDIX C to the General Conditions of the Contract

INDEX OF COMMONLY-USED FORMS

(Forms used during bidding are located in Attachment B to the Instructions to Bidders)

Form of Subcontract – MGL c 149, s. 44F

Procedure for Payment to Contractors

Payment Voucher Input Form

Requisition for Payment (DCAMM Form S1b) and Instructions

**Instructions Regarding Change Orders and Contract Modifications
(DCAMM Form 13)**

Daily Time and Material Report for Change Orders

**Request and Agreement for a Change in the Plans,
Specifications and/or Contract (DCAMM Form 5)**

Notice of Intent

Contractors Weekly Workforce Report

Contractors Workforce Employee Set Up Form

Weekly Payroll Report Form and Statement of Compliance

Quarterly Projected Workforce Table

Certification of Payment by Contractor to MBE/WBE and Instructions

Certificate of Completion by Minority/Women Business Enterprise

Form for Transfer of Title (Work Not Incorporated, DCAMM Form 16)

Certificate of Agency Use and Occupancy -E-1

Certificate of Final Inspection, Release and Acceptance - E-2

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE FOR ADMINISTRATION AND FINANCE
ONE ASHBURTON PLACE, BOSTON, MASSACHUSETTS 02108

**PROCEDURE FOR PAYMENT TO
CONTRACTORS**

I. APPLICATION AND DISTRIBUTION

This bulletin is effective on all construction projects subject to the control and jurisdiction of the Division of Capital Asset Management and Maintenance hereinafter referred to as the "Division", as provided by Chapter 7, G.L. Section 39A through 43G as amended.

This form is available to all General Contractors: Sub-contractors, Designers, Resident Engineers, and on request to any party of interest.

This form constitutes a method of contractual procedure noted in the General Conditions of the Contract and is not a rule or regulation as defined by the STATE ADMINISTRATIVE PROCEDURE ACT, M.G.L. c. 30A, s. 5.

No deviation from the procedures set forth in this form may be made without the express authorization of the Division of Capital Asset Management and Maintenance ("DCAM").

II. STATUTORY REFERENCES, DEFINITIONS, ETC. M.G.L. c. 30, s. 39K (Non-Building Contracts); DCAM Standard Vertical Construction Contract as amended. All General Contractors, Sub-Contractors, Designers, and Resident Engineers should thoroughly familiarize themselves with said contract.

III. PREPARATION AND PROCESSING OR PERIODIC PAYMENT

Periodic payment requests shall be submitted monthly on the day of each month corresponding to the date of the contract. Submission in this manner staggers the receipt of invoices in the DCAM office and expedites processing of contractors' payments.

The General Contractor and his sub-contractors, the Designer and the Resident Engineer(s) shall consult prior to the date of submission for each periodic payment request as to the percentage value of work completed.

All questions as to the value of the work performed and as to payment for materials not incorporated into the work should be resolved in advance of the submission of the formal request for periodic payment. It is suggested that a job conference is the most effective way of resolving any questions of matters of dispute. The General Contractor shall submit to the Resident Engineer for the Resident Engineer's approval, well in advance of the submission of the first periodic estimate, a breakdown of the various items of work corresponding to the sections of the specifications making up the lump sum for item 1, Work of the General Contractor; and each section under Item 2, Sub-bids, of the contract. In addition, the General Contractor and each sub-contractor shall furnish the Resident Engineer with two (2) copies of any necessary sub-breakdowns of each section and such other detailed information as required by the Resident Engineer to evaluate properly the percentage of the work performed. The Resident Engineer shall submit one copy to the Division, as approved by the Resident Engineer upon request.

The General Contractor shall prepare its formal request for periodic payment on DCAM Form Slb (See attached Requisition for Payment-Form Slb Instructions) itemized as approved by the Resident Engineer (Note that the percentage value of work completed (column 7) shall be approximate only and computed to the next highest 1% of the dollar value). Payment shall be computed on the basis of a retention of five percent (5%) of the value of the work completed and entered in Column 9 of Form Slb.

On unit price items enter the number of units in columns 4 and 7 instead of percentages.

If the periodic request for payment includes a request for payment for materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed to in writing), Form Slb must be accompanied by two (2) copies of Form DCAM 16 (Transfer of Title) and evidence satisfactory to the Division of title vested in the Contractor Form 16 must be executed by the General Contractor.

The General Contractor shall prepare sufficient copies of Slb the request for periodic payment for the following distribution:

- Original - DCAM
- Copy 1 - DCAM
- Copy 2 - DCAM (for Resident Engineer, see 6-01)
- Copy 3 - Designer
- Copy 4 - Resident Engineer
- Copy 5 - Contractor
- Copy 6,7 - Required on federally aided projects only.

In addition, the Contractor shall prepare one set of Form CD-12 (Standard Invoice) for the amount of the periodic request signed by a properly authorized signatory as vendor; and forward along with, but not attached to, the properly certified Form Slb to the Division of Capital Asset Management via the Resident Engineer and the Designer, Copies 1,2,3, for DCAM, 4 Resident Engineer.

IV. CERTIFICATION

The General Contractor shall sign all copies of the invoice and present same to the Resident Engineer certifying the value of work performed. In the event of any dispute as to the formal request for periodic payment, the Resident Engineer and/or the Designer shall in the absence of their certification on the Slb Form attach to each copy a qualified certification and a recommendation as the the dollar value of the item or items in dispute to be-retained by DCAM in accordance with Chapter 30, Section 39K. In the signatory space write "See attached Letter". Neither the Resident Engineer nor the Designer shall alter the Slb submitted with the formal request for payment in any manner. If the Division concurs with the Engineer and/or Designers recommendation, adjustment shall be made on Form Slb by the Division. Attention of the General Contractor is directed to the statement to the effect that payments to all sub-contractors have been made in accordance with the provisions of Mass. G.L. c. 30, s. 39F which statement must be signed under penalty or perjury on each copy by the General Contractor. Column 6 of Form Slb applicable to filed sub-contractors only.

V. PROCESSING FOR PERIODIC PAYMENTS

It shall be the sole responsibility of the General Contractor to choose the delivery of the request for periodic payment in proper form and arithmetically correct to the Resident Engineer (the designee provided in G.L. C30, Sec. 39K). In the event there is no Resident Engineer assigned to the contract, the Designer shall be the designee. If there be neither a Resident Engineer nor a Designer, the designee shall be the DCAM project field office or alternatively the home office of the Division, One Ashburton Place, 15th Floor, Boston, Mass. 02108. Payment shall be due and payable within thirty (30) days after receipt by the designee. Request for periodic payment not in the required form containing arithmetical computations which are not correct will within seven (7) days be returned to the contractor and the prescribed period for payment shall commence upon the date which the corrected periodic estimate is received at the Boston office of DCAM. Attention is directed to the provision of M.G.L. c. 30, s. 39K which provides that the awarding authority may make changes in any periodic estimate submitted by the contractor.

VI. INQUIRY AS TO PERIODIC REQUESTS FOR PAYMENT - PAYMENT FLOW

All inquiries as to the value of the work performed, certified and due to the General Contractor, its Sub-Contractors and suppliers shall be directed to the Resident Engineer. Interested parties are requested not to contact DCAM directly on these questions in order that the full attention of DCAM may be devoted to speedy processing of the requests. Resident Engineers should contract the Fiscal Section of DCAM only as absolutely necessary and relay the information to inquiries to the interested parties. All other inquiries must be submitted in writing to DCAM.

This invoice is public information and shall be available in the office of the Resident Engineer for examination by any and all interested party.

A typical periodic payment progress flow follows:

DESIGNEE	MAXIMUM TIME
Contractor	Submits monthly invoice
Resident Engineer	Two (2)days including transmittal time.
Designer	Two (2) days including transmittal time.
DCAM Fiscal Section (Routing Control Log)	Two (2) days.
DCAM Office of Planning Design and Construction	Three (3) days.
DCAM Fiscal Section (Return or Process)	Two (2) day return; Five (5) days process.
Comptroller, Treasurer, Governor's Council	Seven (7) to Sixteen (16) days.
Contractor	
Lost time in any 30 day period Sat. & Sun.	Nine (9) to Twelve (12) days.

VII. SPECIAL INSTRUCTION TO EMPLOYEES, RESIDENT ENGINEERS & DESIGNERS

The Resident Engineer and the Designer shall give their immediate attention to the certification of request for periodic payments to contractors and under no circumstances are these requests to be delayed. The Resident Engineer and the Designer shall rigidly adhere to the instructions contained in this Bulletin and immediately expedite certification in order that the periodic payment requests may be delivered by the Contractor to DCAM for processing without delay. The Resident Engineer and the Designer shall process the payment within two (2) days each signatory including transmittal time.

Failure to comply may constitute a breach of ARTICLE V, Phase 3 Paragraph 2, of the standard DCAM Design Service Contract, or a violation of Section II. 14. of the DCAM Resident Engineer Manual.

THE COMMONWEALTH OF MASSACHUSETTS
DIVISION OF CAPITAL ASSET MANAGEMENT
PAYMENT VOUCHER INPUT FORM



DOCUMENT ID							VENDOR NAME AND ADDRESS			
FY	PAYMENT TYPE (CIRCLE ONE)	DEPT	UNIT	ID NUMBER	DATE	ACTION:				
	PRC GAX INP	DCP				E				
HEADER INFORMATION										
BUDGET FY	FISCAL YEAR	PERIOD	VENDOR CUSTOMER CODE NO:	VENDOR ADDRESS CODE						
			VC							
DOCUMENT TOTAL	MASS STATE PROJECT NO.:						VENDOR CERTIFICATION I certify that the goods were shipped or the services rendered as set forth below. (Please Sign In Ink)			
\$ -	PROJECT DESCRIPTION:									
SCHEDULE PAY DATE	LOCATION:									
	INVOICE TOTAL:									
REFERENCE ENCUMBRANCE DOCUMENT INFORMATION										
Encumbrance Type CT / PC / GAE	ENCUMBRANCE DOCUMENT NUMBER			Reference Type P or F	Vendor Invoice No:	Vendor Inv. Line	Vendor Inv. Date			
				P						
COMMODITY INFORMATION										
Commodity Line #	Commodity Code	Quantity	Unit Price	Contract Line Amount	Rec'd Service From Date	Rec'd Service To Date				
				\$ -						
ACCOUNTING INFORMATION										
Accounting Line #	Event Type	Line Amount	Unit	Appropriation	Object	Function	Location	Program Code	Budget Code	
		\$ -								
TO THE COMPTROLLER OF THE COMMONWEALTH OF MASSACHUSETTS:										
I hereby certify under the penalties of perjury that all laws of the Commonwealth governing disbursements of public funds and the regulations thereof have been complied with and observed.										
Prepared By: _____			Title: _____			Date: _____				
Entered By: _____			Title: _____			Date: _____		Page # _____ Of _____		
The undersigned authorized signatory approving this document certifies that this document and any attachments are accurate and complete and comply with all applicable general and special laws and regulations.							INSTRUCTIONS TO VENDOR * Fill in shaded areas. * Direct inquiries to state organization.			
Approved By: _____			Title: _____			Date: _____				

Project Number
 Contract Number
 Institution
 Gen. Contractor

**EXECUTIVE OFFICE FOR ADMINISTRATION
 AND FINANCE
 DIVISION OF CAPITAL ASSET
 MANAGEMENT AND MAINTENANCE
 ONE ASHBURTON PLACE
 BOSTON, MASSACHUSETTS 02108**
 REFER TO REVERSE SIDE FOR INSTRUCTIONS

Requisition for Payment No.
 CONTRACT DATES
 Starting Date
 Orig. Completion
 Approved Extension

Billing Period from		to						
Item No	Description of Work	Contract Amount	Previous Requisition		Net Amount Paid Filed Subs	This Requisition		
			%	Amount		%	Amount	Retainage
1	2	3	4	5	6	7	8	9
TOTALS								

\$ SUMMARY	
A. Enter Total fm Col. 8 →→→→→	\$
B. Total Col. 9	\$
C. Total Prev. Paid	\$
D. Other Deduction	\$
E. Total B C D →→→→→	\$
F. Subtract E fm A for NET DUE	\$
G. Less Deductions by DCAM	\$
H. Adjusted Net Due	

SIGNATURES

I certify that the value of work shown above has been performed and the provisions of G.L. c.30, s 39F&K have been complied with.
 Contractor: _____ Date: _____

Do not alter requisition as presented. Indicate recommended changes on a separate letter.
 CERTIFIED CORRECT
 Resident Engineer _____ Date: _____
 Architect/ Engineer _____ Date: _____

PAYMENT RECOMMENDED

DCAM Project Engineer: _____ Date: _____
 DCAM Project Manager: _____ Date: _____

(REQUISITION FOR PAYMENT--Form S1b)

INSTRUCTIONS

The contractor is solely responsible to deliver this requisition for payment, properly certified and arithmetically correct in the manner set forth in Article VIII.4 of the General Conditions of the Contract. Except for change orders, unit prices or semi-final and final payments, use whole dollars only.

The contractor billing date shall be monthly on the date of the month corresponding to the contract agreement date of the contract document. Submission in this manner staggers the receipt of invoices in the DCAM office and expedites processing of payments to contractors. Contractors who do not choose to invoice monthly must nonetheless pay their filed subcontractors pursuant to M.G.L. c.30, s. 39F. Requisitions which are for billing period beyond the original contract completion date or completion date as formally extended shall be (1) returned to the contractor as a premature billing pending approval of an extension of time or (2) liquidated damages shall be assessed.

Invoices: Original and 2 copies of DCAM Form S1b properly certified for DCAM. 1 copy for the contractor. On a federally aided project 2 additional copies are required for DCAM. Also, a completed Commonwealth of Massachusetts standard invoice Form CD1 2 must accompany each requisition, Copies 1,2,3, for DCAM; 4 Resident Engineer; 5 contractors' file.

- Column 1. Insert section numbers from specification (minimum acceptable breakdown.)
- Column 2. Description of work (trade) from specifications. On unit price contracts include the estimated # or units from the proposal and the unit price.
- Column 3. Enter the dollar value of the work described on Col. 2. On filed subcontract work the amount in col. 3 MUST be the actual filed sub bid award price. On unit price contract work enter the extended amount of the estimated quantities times the unit proposed.
- Column 4. Leave blank on first requisition; on all subsequent requisitions enter the % appearing in col. 7 of the previous invoice. On unit price contracts enter the number of units previously billed.
- Column 5. Leave blank on first requisition; on all subsequent requisitions enter the amount appearing in column 8 of the previous invoice.
- Column 6. Enter the net amount actually paid to the filed subcontractors as of the date of preparation of the current billing as applicable to the base subcontract price. Once only, breakdowns of the amount paid to filed subcontractors on a change order must accompany and be attached to the first requisition to follow the 100% billing of the change order. Said breakdown must refer to the change order request number, DCAM approval number and the net amount paid to each applicable subcontractor involved in the change. Contractors are reminded that

G.L. c. 30, s 39F requires backcharges to be presented to subcontractors as they occur and under the law said backcharges cannot be accumulated and presented at the completion of the work.

Column 7. Determine the total progress of the item completed to date and enter said % in col. 7. On unit price contracts enter the total units completed to date.

Column 8. Multiply the % value appearing in column 7 times the contract amount in col. 3 for the col. 8 value of work completed to date amount.

Column 9. Regular contract retainage is 5% of the amount appearing in col. 8. 5% must be retained until a certificate of substantial completion, use or occupancy or a certificate of final acceptance is executed. When the contractor desires to retain an amount in excess of 5% an explanation must be attached.

Change Orders: Change orders cannot be invoiced unless and until an executed green change order DCAM Form 5 is received by the contractor. Upon receipt of said executed change order contractor may bill against the change as the work progresses. Enter in col. 2 of the requisition form beneath the last regular contract item, the change order request # and the DCAM approval #. Enter in col. 3 the total amount of the change (i.e. C.O. 1-I \$ 2,000.) Enter credit change orders in the same manner either in red or with a minus sign or the words CR or deduct after the amount in col. 3.

Payment for amounts due on change order work requires the approval of the Governor and Council each time the % progress of the change order increases. This results in a split check remittance to the contractor. When this occurs a statement from the State Treasurer accompanies the check for work performed under the basic contract advising the contractor that a certain amount has been deducted from the net payment due. The amount deducted is the sum due on change orders which amount will be automatically remitted to the contractor one week after receipt of the check for work performed on the base contract, provided, the reviewing officials do not challenge the need for, or the cost of the change order.

EXPLANATION OF DEDUCTIONS BY DCAM: Funds retained by the Division of Capital Asset Management under paragraph G of the invoice are held pursuant to authority under M. G. L. c. 30, s. 39K and the amount withheld is based on the reasons set forth below. Any additional deductions by the contractor under paragraph D of the invoice summary should be briefly explained in this space.

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE FOR ADMINISTRATION AND FINANCE
DIVISION OF CAPITAL ASSET MANAGEMENT
ONE ASHBURTON PLACE, 15th Floor
BOSTON, MASSACHUSETTS 02108

**INSTRUCTIONS REGARDING CHANGE ORDERS AND CONTRACT
MODIFICATIONS**

SECTION 1. STATUTORY AND CONTRACTUAL PROVISIONS

- 1.01** This instruction form supplements Article VII of DCAM's General Conditions of the Contract but is not intended to supersede or modify any of the provisions contained therein. It is available for general distribution and is applicable to all projects under the jurisdiction of the DCAM.

The statutory authorities for a change in the plans, specifications and/or contract are provided in Mass. G.L. Chapter 7, Section 42E-42I and in Mass. G.L. Chapter 30, section 39, 39J, 39N, 39P, 39Q (Refer to Article VII of the General Conditions of the Contract). All parties must keep themselves informed of any amendments affecting said statutes.

NO CHANGES (ADDITIONS, SUBSTITUTIONS OR ELIMINATIONS) IN THE PLANS, SPECIFICATIONS OR CONTRACT SHALL BE COMMENCED UNTIL RECEIPT BY THE CONTRACTOR OF: (a) AN APPROVED DCAM FORM 5 OR (b) A WRITTEN NOTICE OF INTENT SIGNED BY THE PROJECT MANAGER OR DEPUTY COMMISSIONER, AS APPROPRIATE, AUTHORIZING THE CHANGE.

All requests for changes increasing the contract price must be submitted on DCAM Form 5, prior to the final acceptance of the project. The Contractor waives all rights against the Commonwealth if it fails to comply with this requirement. DCAM shall be under no obligation to process a request for change after final acceptance of the project.

The term "request for change" is used throughout these procedures and applies to every request to revise the contract requirements.

The request for change must be made in writing, and in accordance with the provisions of the Contract, the General laws, rules, regulations and other procedures of DCAM.

1.02 GENERAL PURPOSE

The purpose of these procedures is to properly authorize necessary changes, provide satisfactory documentation supporting the nature and cost of each change, and allow the change order work to be accomplished in a timely and efficient manner.

It is the intention of DCAM and the applicable statutory provisions that whenever possible the parties should agree upon an equitable adjustment in the contract price before commencement of the pertinent work.

All parties shall negotiate in a professional manner and agree upon the particulars associated with the change in the work, thereby facilitating an approved change order.

It is the responsibility of the Contractor to substantiate clearly the costs associated with all changes.

If the Contractor refuses to provide the project manager with cost estimates for a proposed change in the work, the project manager may unilaterally determine the reasonable cost for that change, and the Contractor must proceed with the work based upon the project manager's established cost.

SECTION 2. SUBMISSION AND DISPOSITION OF DCAM NOTICE OF INTENT ("NOI")

2.01 AUTHORIZED REQUESTORS

1. General Contractor, including Sub-Contractor
2. Designer
3. User Agency
4. DCAM

2.02 THE REQUESTOR SHALL:

- a. Initially discuss the proposed request for change with all interested parties.
- b. If the Designer or DCAM is the requestor, forward to the Contractor a written request for proposal.
- c. If the User Agency is the requestor, forward a written request to DCAM with copies to the Designer and the Resident Engineer. The agency shall provide written documentation supporting reasons for a request for change.
- d. If the Contractor is the requestor see Section 2.03, below.

2.03 THE CONTRACTOR SHALL:

If the Contractor is the requestor or if it receives a request for change it shall:

- a. a. Submit a written request for a Notice of Intent (NOI) indicating the proposed change in the work and the proposed method of compensation, as set forth in Article VII of the General Conditions of the Contract and in Section II of the DCAM Form 5. The written request shall include a cost breakdown with the requested change as outlined in Article VII of the General Conditions of the Contract. The breakdown of all filed sub-contractors shall be separated from the General Contractor's breakdown and both are required to be on properly identifiable letterhead stationary,

and signed showing (a) quantities and costs utilizing unit pricing, (b) the classification and hours of labor, fringe benefits and the complete breakdown showing unit cost of material and equipment, and (c) any other allowable costs as set forth in Article VII. See also Section 5, below

- b. The written request for a NOI and accompanying documentation shall be addressed to the DCAM Deputy Commissioner of the Office of Planning, Design and Construction, and sent to the attention of the Project Manager. One copy shall be addressed to the Designer, one to the Resident Engineer and one to the DCAM Project Engineer.
- c. Each written request for an NOI must include all costs associated with the request for change.
- d. The General Contractor shall review all cost breakdowns being submitted by its suppliers and subcontractors and check them to insure the information being submitted is accurate and mathematically correct.

2.04 THE RESIDENT ENGINEER SHALL:

- a. Note the receipt of written request for an NOI in the record of NOIs/Change Orders, diary, and daily report.
- b. Inform the Designer, the Project Manager and the Project Engineer of the request for an NOI.
- c. Review both quantities and prices of labor and materials and recommend corrections or changes. Check to make sure the required breakdowns are attached from all subcontractors on properly identifiable letterhead.
- d. If any request is inaccurate, incomplete, contains insufficient credits due to the Commonwealth or is otherwise unacceptable, the Resident Engineer shall note the return of a request for an NOI in the record of NOIs/Change Orders, diary, daily report and return the request to the Contractor with a dated cover letter detailing the reasons for return.

2.05 THE DESIGNER SHALL:

Immediately evaluate the requested change and the Contractor's request for an NOI and proposal and transmit the Designer's recommendation and those of the Resident Engineer by written memorandum or telephone if the situation warrants, to DCAM's Project Manager or Project Engineer.

2.06 DCAM SHALL:

If DCAM agrees with the request for change and the Contractor's proposal it shall promptly issue an NOI using the DCAM Notice of Intent Form and forward the NOI to the Contractor, with copies to the Designer and the Resident Engineer. It is mandatory that, upon receipt of said NOI, the Contractor proceed with the ordered work.

If DCAM does not agree with the request for change or the Contractor's proposal it shall notify the requestor and all other parties in writing.

SECTION 3. SUBMISSION AND DISPOSITION OF DCAM FORM 5

3.01 THE CONTRACTOR SHALL:

- a. Complete applicable portions of Section I of Form 5 (four (4) original green sheets and two (2) copies, all with original signatures.)
- b. If there is insufficient room in the space provided under Section I (b) of the Form 5, attach to the form a statement giving reasons for, location of, and a general description of the proposed change including a reference to the plans and specifications, if possible.
- c. Submit proposed method of compensation, as set forth in Article VII of the General Conditions of the Contract and in Section II of the DCAM Form 5. Submit a cost breakdown with the requested change as outlined in Article VII of the General Conditions of the Contract. The breakdown of all filed sub-contractors shall be separated from the General Contractor's breakdown and both are required to be on properly identifiable letterhead stationary, and signed showing (a) quantities and costs utilizing unit pricing, (b) the classification and hours of labor, fringe benefits and the complete breakdown showing unit cost of material and equipment, and (c) any other allowable costs as set forth in Article VII. See also Section 5, below. Upon completion of the work, changes initially authorized by the NOI on a "(c) Time and Material basis" must be adjusted by DCAM's Daily Time and Material Report Forms.
- d. If additional time is requested, furnish an explanation with the breakdown. Extensions of time shall not be granted on a retroactive basis because of changes.
- e. Each change must be all-inclusive as to all costs and all time extensions.
- f. The General Contractor shall review all cost breakdowns being submitted by its suppliers and subcontractors and check them to insure the information being submitted is accurate and mathematically correct.
- g. Deliver six (6) Form 5s, complete in accordance with these procedures to the Resident Engineer. This shall include four (4) original green sheets and two (2) copies of the Form 5, all with original signatures.

3.02 THE RESIDENT ENGINEER SHALL:

- a. Note the receipt of Form 5 in the record of NOIs/Change Orders, diary, and daily report.
- b. Inform the Designer, the Project Manager and the Project Engineer of the receipt of Form 5.

- c. Review the Form 5, accompanying backup documentation and other relevant materials and determine whether the requested change is or is not covered under the contract
- d. Review both quantities and prices of labor and materials and recommend corrections or changes. Check to make sure the required breakdowns are attached from all sub-contractors on properly identifiable letterhead.
- e. If any request is inaccurate, incomplete, contains insufficient credits due to the Commonwealth or is otherwise unacceptable, the Resident Engineer shall note the return of the Form 5 in the record of NOIs/Change Orders, diary, daily report and return the Form 5 to the General Contractor for correction, unsigned by the Resident Engineer, and detail the reasons for returning the Form 5.
- f. Maintain accurate records indicating particulars involving additional work, credit due, substitutions, delays, work stoppage, and other conditions associated with any potential or actual request for a change, NOI or Change Order.
- g. If the Resident Engineer recommends approval of the Form 5, the Resident Engineer shall sign Section III of the Form 5 and attach a written statement addressing each of the eight (8) questions listed in the following section, Section 3.03.
- h. If the Resident Engineer does not recommend approval of the request, he or she shall attach a detailed letter setting forth the reasons for disapproval. Forward the four (4) originals of Form 5 and two (2) copies, without the Resident Engineer's signature on the form, along with the letter detailing the reason for disapproval to the Designer.

3.03 THE DESIGNER SHALL:

- a. Review the Form 5, accompanying backup documentation and other relevant materials and determine whether the requested change is or is not covered under the contract.
- b. If the Designer recommends approval of the Form 5, complete applicable portion of Section III of Form 5 and attach its letter of recommendation which must include responses to each of the following eight (8) statements:
 - (1) If such change request involves any substitution or elimination of materials, fixtures or equipment, state the reasons why such components were included in the first instance and the reasons for substitution or elimination, and if the change request is of any other nature, the reasons for such change, giving justification therefor. The designer shall state why all changes are necessary.
 - (2) If the change involves additional work, state why work was not covered by the plans and specifications. Plan and specification references shall be stated.

- (3) Review the contract documents and determine if all applicable credits due the Commonwealth are included and if salvageable items are to be turned over to the operating agency.
 - (4) A statement of concurrence that the description of the work in Section 1 (b) of Form 5 is accurate.
 - (5) The Designer has examined the Contractor's Proposal and finds the cost to be reasonable and mathematically correct. Indicate which quantities and/or costs appear unreasonable or excessive.
 - (6) If applicable make a recommendation on the Contractor's request for additional time.
 - (7) If the work was performed under protest, pertinent correspondence shall be attached to the original Form 5.
 - (8) Reference to date and amount of any NOI(s) or any previously approved not-to-exceed Form 5(s) issued, applicable to the change.
- c. If recommending approval, forward the four (4) original green sheets plus the two (2) copies of the Form 5, all with original signatures, to DCAM along with the Designer's recommendation.
 - d. If the Designer disapproves the request, the Designer shall within seven (7) calendar days attach a detailed letter setting forth its reasons for disapproval. Forward the four (4) originals of Form 5 and two (2) copies without the Designer's signature on the form along with its letter detailing its reason for disapproval to DCAM.

3.04 DCAM SHALL:

- a. Notify all parties if funds are insufficient to cover the change and return to the Contractor, through the Resident Engineer, any request that is incomplete, without proper details or recommendations.
- b. The Form 5 shall be logged and given a change request number. The numbering will be in numerical sequence.
- c. If the Form 5 is approved, DCAM shall complete the financial block and distribute the four (4) originals to the following: the Contractor, the DCAM Contract Section, the Comptroller and the Project Engineer with the two (2) copies distributed to the Designer and the Resident Engineer.
- d. If DCAM disapproves the request, it shall notify the Contractor, the Resident Engineer and the Designer in writing. In such an event the Contractor may within 30 days from the receipt of notice, appeal such action to the Commissioner of the Division (see G.L. Chapter 7, section 42G). Failure to appeal within 30 days shall preclude any further claim of the Contractor for a contract adjustment. The

Commissioner shall be considered the chief executive officer referred to in G.L. Chapter 30, section 39Q (1) (a).

- e. Further change order appeal proceedings shall be governed by the provisions of G.L. Chapter, section 39Q, and by the terms of the Contract including Article VII, Section 5 relating to mandatory mediation procedures.

SECTION 4. AUTHORITY TO APPROVE REQUESTS FOR CHANGE

4.01 The Deputy Commissioner of the Office of Planning, Design, and Construction's approval shall be required whenever :

- a. the cumulative cost of previously approved NOIs and approved Form 5s exceeds five percent of the original contract award price; or
- b. the estimate for the work on the NOI or Form 5 exceeds \$5,000.

4.02 With the prior written approval of the Deputy Commissioner of the Office of Planning, Design, and Construction, the Project Manager shall approve change orders for DCAM when:

- a. the cumulative cost of previously approved NOIs and approved Form 5s is less than five percent of the original contract award price; or
- b. the estimate for the NOI or Form 5 is less than \$5,000.

SECTION 5. MISCELLANEOUS DIRECTIONS FOR COMPUTING COSTS FOR CHANGES IN WORK

5.01 Shipping, storage and handling costs and materials and equipment involved in a change in work may be included in the costs for change, if itemized and accompanied by copies of paid invoices.

5.02 The allowance for overhead provided in Article VII section 2 shall be considered to include all hand and power tools normally required in the performance of the base bid work, the cost of the Contractor's superintendent, the Contractor's administration costs, and the Contractor's estimating costs.

5.03 Major items of equipment, specialized tools, and ordinary materials and equipment used or consumed on the change order work, whether rented or owned by the Contractor, may be included in the cost of the change provided current rental rates and material costs, supported by paid invoices, are submitted as backup to the change when itemized.

5.04 The Project Manager may approve lump sum change order requests on changes costing \$1,000 or less, without requiring the Contractor to provide a breakdown for the costs incurred on the change. The Project Manager reserves the right to require cost breakdown and invoices from the Contractor on all changes. Breakdowns are required for all unit price changes (cost per item) and Time and Material change orders regardless of the cost.

5.05 Contractors shall meet the following guidelines when submitting cost breakdowns for labor:

- a. The Contractor must designate the name of trade, and the number of hours times the base journeyman rate. The foreman rate should only be used and pro-rated as provided for in the union rules.
 - b. Insurance and payroll taxes shall be identified as a percentage, applied to the total labor rate. DCAM allows 30% to be used for insurance and taxes. Any increase in this percentage must be supported by a written breakdown of all insurance and taxes applied to each particular trade. No overhead and profit is allowed on insurance and taxes. (see General Conditions, Article VII, section 2).
 - c. Hourly benefit amounts such as health, welfare, and pensions must be identified separately.
 - d. When overtime work is involved, insurance charges and benefits are based on straight time only.
 - e. If travel is involved, it should be submitted as provided by the union regulations, this, in most cases, is based on mileage. No overhead and profit will be paid on travel.
 - f. Whenever a subcontractor is involved, a complete and separate breakdown must be submitted by the subcontractor for its portion of work. Non filed subcontractors should not include overhead and profit on their breakdown.
 - g. All breakdowns should be legible, submitted on letterhead and signed by an authorized representative of the Contractor. This applies to all Subcontractors and General Contractor.
- e. Credits should always include a bond reduction.

5.06 General Contractor's bond premium shall be included at the following rates. If a Contractor's bond rate differs from this list verification from the bond carrier must be submitted showing the actual rate.

<u>Contract Price</u>	<u>Rates per Thousand</u>
(a) Contracts up to \$500,00	\$14.40
(b) \$500,000 to \$2,500,000	\$ 8.70
(c) \$2,500,000 to \$5,000,000.....	\$ 6.90
(d) \$5,000,000 to \$7,500,000.....	\$ 6.30
(e) \$7,500,000 and up.....	\$ 5.76

- 5.07** For Time and Material Change Order Work: Daily time and material records shall be prepared by the Contractor and copies maintained by the Resident Engineer for all changes authorized under the above sections. Upon the completion of the work authorized, the Contractor shall submit a formal change order with all the required supporting data, verified and signed by the Resident Engineer.
- 5.08** If a Contractor desires to be compensated as authorized work progresses, it shall, after receipt of an NOI, immediately submit a DCAM Form 5 as outlined in paragraph 3.01.

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE FOR ADMINISTRATION AND FINANCE
DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE
One Ashburton Place, Boston, MA 02108

**DAILY TIME AND MATERIAL REPORT FOR ALL
CHANGE ORDER WORK OR WORK DONE UNDER PROTEST**

Project No. _____ Contract No. _____ Date: _____

Project Title _____ Authorized by Emerg.No. _____

Contractor _____ or Change Order No. _____

or work under protest _____

Sheet _____ of _____

Was any contract work performed today other than C.O. concerned? YES NO
If Yes, list on Daily Progress Report.

Labor - Change Order or Alleged Extra Work Done Under Protest

Trade	Name of Worker	Hrs.	Remarks

Submitted by Superintendent _____
Subcontractors _____

Resident Engineer (note any discrepancy in above report)
Resident Engineer _____

The signature of the Resident Engineer is for verification of labor listed above and does not constitute acknowledgement that such labor is for extra work or that additional monies are due for such work.

Daily Time and Materials Report -Continued.

1. Materials Used -- Describe Fully
2. Misc. Equipment, Etc.-Describe Fully (Note if operator and crew are included with equip.)

Submitted by Superintendent _____

Subcontractors _____

Resident Engineer (note any discrepancy in above report)

Resident Engineer _____

The signature of the Resident Engineer is for verification of materials listed above and does not constitute acknowledgement that such material is for extra work or that additional monies are due for such work.

Send one copy with Daily Report Each Day

Other copy to accompany Green Sheets to Designer when Change Order is completed

Prepare in duplicate

DIVISION OF CAPITAL ASSET MANAGEMENT

DCAM CHANGE REQUEST NO. _____

**THE COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE FOR ADMINISTRATION & FINANCE
REQUEST AND AGREEMENT FOR A CHANGE IN THE PLANS AND/OR SPECIFICATIONS AND/OR CONTRACT**

All signatures are affixed under the penalties of perjury.

Project No. _____ Contract No. _____ Title _____
Location _____

I. REQUEST

(a) Requested by _____ of _____
(b) Requestor's description of change _____

II. GENERAL CONTRACTOR'S PROPOSAL REQUEST NO. _____

For all costs involved in this change including extensions of time herein requested the undersigned general contractor proposes to perform the work describe above in accordance with the provisions of Article VII of the contract and certifies that the attached cost data is accurate, complete and current and mathematically correct.

Payment shall be made on the basis of:

(a) Predetermined lump sum total of (add) (deduct) \$ _____

(b) Lump Sum not to exceed (add) (deduct) \$ _____
(max price based on contract unit prices or negotiated agreed unit prices)

(c) Time and Materials Basis not to exceed (add) (deduct) \$ _____
(Computed in accordance with Article VII of the contract) (Require authorization of Commissioner)

Place X beside selected proposal method and strike out either (add) or (deduct) whichever does not apply. Attach detailed estimates and break-down for above in accordance with change order instructions. A claim for work performed under protest shall be submitted per (c) above.

An extension of contract time of _____ calendar days is requested.

Contractor _____ by _____
Firm Name Authorized Signature Date

III. APPROVAL RECOMMENDED BY:

The Designer and the Resident Engineer must attach their respective letters of recommendation with responses to questions listed in Form 13, change order instructions. Adverse or altered recommendation must be delineated on the letters.

Resident Engineer _____ Date _____

Designer _____ Date _____

Project Engineer _____ Date _____

Project Manager _____ Date _____

Deputy Director _____ Date _____

IV. APPROVED BY THE OFFICE

(a) Operating Agency Letter (attached) (not req'd)

(b) For the amount requested/or corrected to \$ _____

(c) Extended as requested/or corrected to _____ Calendar Days.

(d) This change is in the best interest of the Commonwealth and constitutes an equitable adjustment to the contract in compliance with Art. VII of the contract.

Authorized Signature _____ Date _____

Upon signature by the Office, this request becomes a formal change order for immediate distribution.

Do Not Fill in This Block	
Contract Award	\$ _____
Previous Addition	\$ _____
Previous Deductions	\$ _____
Previous Net Total	\$ _____
This Change	\$ _____
Total To Date	\$ _____

Contract Completion Date
Extended to _____ Date _____
If applicable to Phase _____
of Contract
Office Change Order Approval # _____

→ NOTICE OF INTENT ←

DIVISION OF CAPITAL ASSET MANAGEMENT
Contract Modification/Authorization to Proceed
(For Change Authorization in the Contract Plans and/or Specifications)

Date:

Massachusetts State Project Number _____ Contract Number _____
Title: _____ Location: _____

Contractor: _____ D-19 Contract Start Date: _____ Contract Award: \$ _____

NOI Request No. _____ Change Order No. _____ Requestor: _____

Nature of Request:
G.C. PCO No. _____
Date: _____

Reason for Request:
Designer's CCR No. _____
Date: _____

This change in work is to be performed according to ARTICLE VII of the General Conditions of the Contract. Change Orders will be in accordance with the contract and Form 13:

_____ Predetermined **"LUMP SUM"** Total of: \$ _____
 = If Checked Additional Verification Backup Data Must Be Provided With Formal Change Order • See Attached

_____ Lump Sum **"NOT TO EXCEED"**: \$ _____
(Maximum Price Based On Contract Unit Prices or Negotiated Agreed Unit Prices)

_____ **"TIME AND MATERIALS"** Not To Exceed: \$ _____
(Computed In Accordance With Article VII of the General Conditions • Requires Authorization of Commissioner)

Resident Engineer Date

Project Engineer Date

Project Manager Date

Deputy Director Date

Deputy Commissioner Date
(Required if More Than 5% Or More Than \$5,000.00)

Commissioner Date
(Required Only On Time & Material Changes)

APPROVAL OF THIS NOTICE OF INTENT DOES NOT ADDRESS REQUEST FOR ADDITIONAL TIME, EXTENSIONS OF CONTRACT TIME WILL BE ADDRESSED UPON SUBMITTAL OF THE OFFICAL CHANGE ORDER. RECEIPT OF THIS REQUEST TO BE ACKNOWLEDGED IN WRITING TO DIVISION OF CAPITAL ASSET MANAGEMENT.

CERTIFICATION OF SUFFICIENT FUNDS BY: _____ YES ___ NO
Change Order Section
DATE: _____

copy: Deputy Director
Project Manager
Project Engineer
Contractor

Resident Engineer
Over \$15,000 - Comptroller
Change Order Section

**CONTRACTOR'S WEEKLY WORKFORCE REPORT
THE COMMONWEALTH OF MASSACHUSETTS
DIVISION OF CAPITAL ASSET MANAGEMENT**

DCAM Project No. _____ Project Name _____ Project Location _____

Name of General Contractor _____ Minority Goal % _____

Name of Contractor Filing Report _____ Address _____ Women Goal % _____

Week Ending _____ Report No. _____ Date Work Began _____

NOTE: Min. = Minority Wom. = Women Check here if this is a final report Date work completed _____

Job Category	Number of Employees	Number of Employees Who Are		Total Weekly Workforce Hours	Total Weekly Workforce Hours		Weekly % Workforce Hours		Total Workforce Hours To Date	Total Workforce Hours To Date		% of Workforce Hours To Date	
		Min.	Wom.		Min.	Wom.	Min.	Wom.		Min.	Wom.	Min.	Wom.
TOTALS:													

Mail to: Division of Capital Asset Management
Compliance Office
One Ashburton Place, 15th Floor
Boston, MA 02108

The undersigned hereby certifies under pains and penalties of perjury that the company submitting this report has faithfully completed the Federal Form I-9 process for each and every employee listed on the certified payroll report (Weekly Payroll Report Form) submitted with this Weekly Workforce Report and that the above information is true and accurate.

Authorized Signature _____ Date _____

Print Name _____ Telephone No. _____

Title _____ Fax No. _____

WEEKLY PAYROLL REPORT FORM
 THE COMMONWEALTH OF MASSACHUSETTS
 DIVISION OF CAPITAL ASSET MANAGEMENT

DCAM Project No. _____ Project Name _____ Project Location _____

Name of General Contractor _____ Check here if this is a final report

Name of Contractor Filing Report _____ Address _____

Week Ending _____ Report No. _____ Date Work Began _____ Date work completed _____

Employee Name & Address	Work Classification	Hours Worked							(A)	(B)	Employer Contributions			(F)	(G)
		S	M	T	W	T	F	S	Total Hours	Hourly Base Wage	(C) Health & Welfare	(D) Pension	(E) Supp. Unemp.	[B+C+D+E] Hourly Total Wage (prev. wage)	[A*F] Weekly Total Amount

NOTE: Every contractor and subcontractor is required to submit a copy of their weekly payroll records to DCAM.

The undersigned states under the pains & penalties of perjury that the above provided and attached information is a true and accurate record of each person employed on the project and the hours worked and wages paid to each such employee, including payments to the referenced benefits. M.G.L. c. 149 §27B.

Authorized signature _____ Print Name _____ Print Title _____

Mail to: Division of Capital Asset Management
 Compliance Office
 One Ashburton Place, 15th Floor
 Boston, MA 02108

WEEKLY PAYROLL RECORDS REPORT & STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c149, section 27B, a true and accurate record must be kept of all persons employed on the public works construction project for which the enclosed rates have been provided. The *Weekly Payroll Report Form* includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the project.

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. This is required to be done on a weekly basis. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor or public body shall furnish to the Executive Office of Labor within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE	
Date: ____ / ____ / 20____	
I, _____,	_____
(Name of signatory party)	(Title)
do hereby state:	
That I pay or supervise the payment of the persons employed by	
_____	_____
(Contractor, subcontractor or public body)	(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 sections twenty-six and twenty-seven of chapter one hundred and forty nine of the General Laws.	
Signature _____	
Title _____	

CERTIFICATE OF PAYMENT
BY CONTRACTOR/DESIGNER TO MINORITY & WOMEN BUSINESS ENTERPRISES
DIVISION OF CAPITAL ASSET MANAGEMENT

TO: Division of Capital Asset Management
 Compliance Office
 One Ashburton Place, 15th Floor
 Boston, MA 02108

Reporting
 Period* _____

Contract Date: _____
 _____ Design Contract
 _____ Construction Contract

RE: DCAM Project No. _____

Project Name _____

The undersigned hereby certifies under the pains and penalties of perjury that the contractor/designer named below has made the following payments to the named Minority and Women Business Enterprises for work performed on the above project:

MBE/WBE Firm Name	Work Performed	Subcontract Amount	Payments This Quarter	Cumulative Payments
<input type="checkbox"/> MBE <input type="checkbox"/> WBE		\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE		\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE		\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE		\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE		\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE		\$	\$	\$
<input type="checkbox"/> MBE <input type="checkbox"/> WBE		\$	\$	\$

Date Submitted: _____

 Name of General Contractor or Design Firm

Telephone No.: _____

 Authorized Signature

Fax No.: _____

 Print Name and Title

* MBE and WBE payment reports are required for each quarter of the fiscal year for each of your DCAM projects. Reports are to cover the following three month periods: 1st quarter, July 1st – September 30th; 2nd quarter, October 1st – December 31st; 3rd quarter, January 1st – March 31st; 4th quarter, April 1st – June 30th. Reports must be submitted within 10 business days of your receipt of this form.

NOTICE: *Intentionally submitting false information in this document may subject the contractor/designer to criminal prosecution and/or debarment from public contracting.*

**INSTRUCTIONS FOR COMPLETING CERTIFICATE OF PAYMENT BY
CONTRACTOR/DESIGNER TO MINORITY & WOMEN BUSINESS ENTERPRISES**

As part of its effort to ensure reliable, up-to-date information concerning the actual payments made to certified MBE and WBE subcontractors on all DCAM projects, the Compliance Office has prepared these instructions to assist you in completing the enclosed form. PLEASE READ THESE INSTRUCTIONS CAREFULLY. THE COMPLIANCE OFFICE WILL RETURN ANY CERTIFICATION OF PAYMENT THAT IS INCOMPLETE OR INACCURATE.

PLEASE NOTE: IF THIS PROJECT IS COMPLETE, ON HOLD, OR YOUR FIRM PREVIOUSLY SUBMITTED A FINAL CERTIFICATION OF M/WBE PAYMENT FOR THIS PROJECT, PLEASE SO INDICATE ON THE FORM AND RETURN IT TO THE DCAM COMPLIANCE OFFICE.

PLEASE INCLUDE THE FOLLOWING INFORMATION IN THE DESIGNATED SECTIONS OF THE FORM:

M/WBE NAME: Include the MBEs and WBEs listed on the project's approved Schedule For Participation and any additional M/WBEs that worked on the project. Please note that any change in MBE and/or WBE participation used to meet the project M/WBE goals must be pre-approved by the Compliance Officer responsible for this project and a Revised M/WBE Schedule of Participation will be required. Contact the Compliance Office immediately if you anticipate or have had any changes in M/WBE participation on this project.

WORK PERFORMED: Include a brief description of the work performed by each subcontractor listed. The description should match the M/WBE Letter of Intent and approved Schedule of Participation. M/WBEs must be SOMWBA-certified in the category of work performed on this project for firms used to meet the project M/WBE goals.

SUBCONTRACT AMOUNT: Include the contract or subcontract amounts listed on the M/WBE Letters of Intent and approved Schedule of Participation. If the value of a MBE/WBE contract or subcontract has decreased or increased for any reason, you must contact the Compliance Officer responsible for this project immediately. If additional M/WBE firms not listed on the Schedule for Participation worked on this project list the amount of their subcontracts.

PAYMENTS THIS QUARTER: Include the amount you paid the M/WBE subcontractor, either directly or indirectly, for work performed on this project during the three month period covered by this Certification of Payment. If the amount paid was zero, please indicate that. Do not include payments from previous periods or estimated future payments in this column. Please note that you may be required to submit copies of cancelled checks to verify the amounts reported for firms used to meet the project's M/WBE goals.

CUMULATIVE PAYMENTS: Include the total amount you paid the M/WBE subcontractor, either directly or indirectly, for work performed on this project for all quarters to date. This amount should equal all payments made during the period covered by this Certificate of Payment as well as all payments from previous periods. The Compliance Office will check the total amount reported this quarter against any payments previously reported. To ensure accurate reporting, please review the prior Certifications of Payments you submitted for this project. Where necessary, correct any earlier mathematical or reporting errors and submit revised Certifications of Payment.

IF YOU HAVE ANY QUESTIONS CONTACT THE COMPLIANCE OFFICE, (617) 727-9320

CERTIFICATE OF COMPLETION
BY MINORITY/WOMEN BUSINESS ENTERPRISE
DIVISION OF CAPITAL ASSET MANAGEMENT

DCAM Project Number _____ Project Location _____

Project Name _____

Name of MBE/WBE Firm _____ Address _____

Name of General Contractor _____ Address _____

DESCRIPTION OF WORK (AS SHOWN IN LETTER OF INTENT)

DESCRIPTION OF ACTIVITY

(Note "Labor Only," "Material Only,"
"Material and Labor," "Complete")

Original Subcontract Amount	\$ _____
Adjusted Subcontract Amount (Change Orders, etc.)	\$ _____
Total Payments Received to Date From Prime Contractor	\$ _____
Total Amount/Balance Due From Prime Contractor	\$ _____

If the completed activity is different from that listed on the Letter of Intent, please explain:

(If more space is needed, continue on back of sheet)

The individuals signing below hereby certify under the pains and penalties of perjury that all work listed on the Contract Letter of Intent (or approved changes thereto as explained above) was completed by the MBE/WBE firm on _____, 20____ and the above amounts listed for these services are true and accurate.

FOR CONTRACTOR

FOR MBE/WBE FIRM

Authorized Signature _____

Authorized Signature _____

Print Name _____

Print Name _____

Title _____

Title _____

Date _____ Telephone No. _____

Date _____ Telephone No. _____

NOTE: To be submitted to the DCAM Compliance Office within ten (10) days after completion of work by MBE/WBE.

Division of Capital Asset Management
Compliance Office
One Ashburton Place, 15th Floor
Boston, MA 02108

PROJECT NO. _____
CONTRACT NO. _____

FORM FOR TRANSFER OF TITLE (DCAM FORM 16)

Name of Contractor or Subcontractor having ownership

Business Address

Date

**KNOW ALL MEN BY
THESE PRESENTS**

That we, _____, of _____
(City)

in the County of _____ and the
Commonwealth of Massachusetts, in consideration of One Dollar (\$1.00) and other
good and valuable consideration paid by the Commonwealth of Massachusetts,
acting through its Division of Capital Asset Management and Maintenance and
receipt thereof is hereby acknowledged, do hereby grant, sell, transfer, and deliver
unto the said Commonwealth of Massachusetts, clear title to, and beneficial
ownership of, the following goods and chattels, namely:

as per attached bills, belonging to us, now on the job site in _____,
(location)
Massachusetts, or at _____ which location has been agreed to in writing.

To have and to hold all and singular the said goods and chattels to the said Commonwealth
of Massachusetts and to its own use and behoof forever.

And we hereby covenant and represent under pains and penalties of perjury that we are the
lawful owner of the said goods and chattels and that they are free from all liens and
encumbrances. And the undersigned individual executing this document on behalf of the
transferor represents and warrants that he or she is legally authorized to execute this
document on behalf of said transferor.

In Witness whereof we, the said _____ hereunto set
(Contractor or Subcontractor's Firm Name)
our hand and seal this ____ day of _____ in the year two thousand and _____.

(Contractor or Subcontractor's Name)
By: _____

Title: _____
hereunto duly authorized

COMMONWEALTH OF MASSACHUSETTS

_____, ss

Then appeared the said _____ to me known or proven to
be the _____ of _____
and acknowledged the foregoing to be his free act and deed and the free act and deed of
_____, before me.

Notary Public
My Commission Expires : _____

The General Contractor hereby certifies under penalties of perjury that the goods and
chattels transferred above meet the requirements of the Plans and Specifications and will
shortly be needed for the Work; that the General Contractor can and will adequately protect
them in accordance with the Contract Documents until they are incorporated in the Work;
that said goods and chattels are insured as required by the Contract Documents; that
acceptance of these goods and chattels by the Commonwealth shall not constitute a waiver
of any claim arising out of the construction contract between the parties, nor of any claims
for breach of warranty, express or implied, or otherwise, arising out of this sale; that it is
understood that the Commonwealth reserves the right to give notice of any of the aforesaid
breaches at any time subsequent to said sale when said breach first appears to the
Commonwealth.

In Witness whereof we, the said _____ hereunto set
(Contractor's Firm Name)
our hand and seal this ____ day of _____ in the year two thousand and _____.

(Contractor's Name)

(Name of Surety Company)

By: _____

(Authorized Signature for Surety)

Title: _____
hereunto duly authorized

I hereby certify, under the penalties of perjury, that the articles or services listed have
been received and are in keeping with the specifications, or are to be received in accor-
dance with customary trade practices, and are in good order except as otherwise noted.
Payment is hereby authorized and is properly chargeable to the designated appropriation.

(Architect) (Engineer) (Date)

Resident Engineer (Date)

**COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ADMINISTRATION AND FINANCE
DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE
ONE ASHBURTON PLACE, BOSTON, MA 02108**

E-1 CERTIFICATE OF USE/OCCUPANCY

FROM AWARDING AUTHORITY: Commonwealth of Massachusetts, Division of Capital Asset Management and Maintenance

TO: General Contractor:

RE: Mass. State Project No.:
Title:
Location:

AUTHORITY: 1) ARTICLE VI of Standard Construction Contract
2) M.G.L. Chapter 30, Section 39K

Pursuant to the authority noted above you are notified that the Commonwealth of Massachusetts, through its Division of Capital Asset Management and Maintenance, is satisfied that the portion of the above noted project, as hereinafter enumerated, is ready for Use and/or Occupancy. [IDENTIFY PORTIONS TO BE USED AND/OR OCCUPIED – IF APPLICABLE]

The Commonwealth of Massachusetts, through its undersigned representatives, hereby accepts from the Contractor, subject to contract stipulation, said portion of the project effective as of Midnight the ____ day of _____, 20____. The Contractor is relieved of responsibility for performing further work or supplying further materials, equipment or items, with the exception of the attached. (Append a complete list of all incomplete or unsatisfactory items of contract work which in the opinion of the Commonwealth are attributable to the fault, negligence or oversight of the Contractor, his sub-contractor, material suppliers, agents, servants or employees.)

The use of any portion of the project or the occupancy of any building or portion thereof by the Commonwealth shall not constitute a final acceptance of any work not performed in accordance with the Contract, nor relieve the Contractor of liability to perform any work required by the Contract or of liabilities with respect to any warranties or guarantees required by the Contract.

The undersigned recommend the issuance of this Certificate for Use/Occupancy.

	Signature	Date
Designer:	by: _____	
Operating Agency:	by: _____	
DCAMM Resident Engr.:	by: _____	
DCAMM Project Engr.:	by: _____	
DCAMM Project Mgr.:	by: _____	

APPROVED

Acting Director of Design and Construction, OPDC Date

original: Operating Agency Project Manager Contract Unit, OFA Contractor (include original E1 cover letter)	ecc: Deputy Commissioner Deputy Director Project Engineer Designer Resident Engineer Economist, OFA Director of Finance, OFA Bid Room Manager, OFA Certification
--	--

E-2 FINAL ACCEPTANCE

CERTIFICATE OF FINAL INSPECTION, RELEASE AND ACCEPTANCE

Mass. State Project No.
Title:
Location:
Contractor:

This is to certify that a complete inspection of the above entitled project was made on _____
by the undersigned and the entire work was completed in accordance with the plans and specifications. The
undersigned recommends acceptance of the project.

_____		by: _____	_____	
Designer		Authorized Signature	Title	Date
_____	_____	_____	_____	_____
Resident Engineer	Date	Manager	Date	Engineer
				Date

CERTIFICATE OF RELEASE

- The undersigned hereby certifies that all work has been completed in accordance with the Plans, Specifications and Contract Documents and that all Change Orders have been supported pursuant to Articles VII and VIII of the General Conditions of the contract.
- | | |
|--------------------------|-----------------------------|
| Contract Award Price: \$ | Adjusted Contract Price: \$ |
| Authorized Additions: \$ | Paid to Date: \$ |
| Authorized Deductions \$ | Balance Due: \$ |
- The undersigned further certifies that in addition to the amount set forth above, there are outstanding and unsettled the following the Change Orders as submitted according to DCAM Form 13.

Request No.	Date:	Amount: \$
Request No.	Date:	Amount: \$
Request No.	Date:	Amount: \$
- Subject to satisfactory disposition of Change Orders listed in Item 3 above, the undersigned releases the Commonwealth of Massachusetts from all further claims for wages or payments to subcontractors or supplies except: (list on attached sheet).

_____	by: _____
Contractor	Authorized Signature
	Date

The above entitled project is accepted as of _____
Date

Deputy Commissioner, OPDC Date

original: Designer
Operating Agency Project Manager
Contract Unit, OFA
Contractor (include original E2 cover letter)

ecc: Acting Director, OPDC
Deputy Director
Project Engineer
Resident Engineer
Economist, OFA
Director of Finance, OFA
Bid Room Manager, OFA



BID PACKAGE

PART IV

SUPPLEMENTARY GENERAL CONDITIONS AND SPECIFICATIONS

SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work by Owner.
5. Work under separate contracts.
6. Future work.
7. Purchase contracts.
8. Owner-furnished products.
9. Contractor-furnished, Owner-installed products.
10. Access to site.
11. Coordination with occupants.
12. Work restrictions.
13. Specification and drawing conventions.
14. Miscellaneous provisions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Meier Hall North and East Wings Roof Replacement.

B. Owner: Salem State University.

1. Owner's Representative: Salem State University Capital Projects Department or as otherwise noted in Contract Documents.

C. Designer: Jones Architecture, Inc. or as otherwise noted in Contract Documents.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work consists of the Work identified in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

- A. The Work shall be conducted in one phase.

1.6 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate Work of this Contract with work performed by Owner.
- B. Work by Owner: None.

1.7 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Work Under Separate Contracts: None.

1.8 PURCHASE CONTRACTS

- A. General: Owner may have negotiated purchase contracts with suppliers of material and equipment to be incorporated into the Work. Owner will assign these purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum, unless otherwise indicated.
- B. Purchase Contracts: None.

1.9 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections as identified by Drawings.
- B. Owner-Furnished Products: None.

1.10 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to areas identified within Contract Documents. Do not disturb portions of Project site beyond areas in which Work is indicated.
1. Limits: Confine construction operations to limits as shown in Contract Documents.

2. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet beyond building perimeter; 10 feet beyond surface walkways, patios, surface parking, and utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in constructed area. These areas are intended to be maximum areas of disturbance permitted but in no case shall the limits exceed those shown on any authority having jurisdiction.
 3. Keep driveways, parking garage, loading areas, and entrances serving premises clear and available at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
 - 1) Timing of deliveries shall be in accordance with applicable Laws and Owner's directions.
 - 2) Prevent delivery trucks servicing or supplying the Project from running their motors while sitting idle.
 4. Take all necessary precautions to ensure safety of bicyclists and pedestrians using campus roads sidewalks.
 5. Clean driveways, walkways, and entrances affected by Work and maintain such in dust free, safe, and usable conditions for motorists, bicyclists, and pedestrians.
- C. Parking: Contractors are subject to Owner's parking regulations, enforcement, and procedures. Parking for personal vehicles on campus is not provided. Limit parking of company vehicles and storage of materials as can be accommodated within limits of Site. It shall be understood that parking for Contractor, Subcontractor, trades, and materialmen engaged upon the Work may not be available immediately adjacent to Site and Contractor may be directed to remotely park some, most, or all such vehicles.

1.11 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Site and adjacent buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner's usage and academic schedule. Perform Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without consent of Owner and approval of authorities having jurisdiction.
 2. Notify Owner not less than 14 calendar days in advance of activities that will affect Owner's operations and academic schedule.
 3. Remove special protections and construction equipment from occupied areas as work is completed.

1.12 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction. Procure all required street closure and connection permits.

- B. On-site Work Hours: Limit Work to normal business working hours of 8:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.
 - 1. Notify Owner not less than 14 calendar days in advance of proposed off-hours work.
 - 2. Obtain Owner's written permission before proceeding with off-hours work.
 - 3. Weekend Hours: 8:00 a.m. to 5:00 p.m.
 - 4. Early Morning Hours: After Midnight and before 7:00am; coordinate with Owner.
 - 5. Hours for Utility Shutdowns: After midnight and before 7:00 a.m.; coordinate with Owner

- C. Work Hours Restrictions:
 - 1. Be advised that residence hall move in and move out days occur in August and May; academic finals occur one week in May and one week in December; and commencement activities occur one week in May. Construction activities shall cease, be limited, or temporarily curtailed during those events; their specific dates will be provided to Contractor at Preconstruction Conference.

- D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than 14 calendar days in advance of proposed utility interruptions. Interruptions, depending upon type, generally must be scheduled on weekends, evenings, or during holiday periods. Contract consideration is deemed to include necessary overtime and premium time required by Contractor to complete utility shutdowns and cutovers.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
 - 3. Temporary Connections: In the event Contractor disrupts any existing services, immediately make temporary connection to place such service back into operation and maintain the temporary connection until permanent connection is made.
 - 4. Interruptions critical to completion of Project shall be listed as Milestones on the Progress Schedule. Program Work such that service is restored in minimum possible time. Cooperate with Owner in reducing shutdowns of utility systems.
 - 5. Owner reserves the right to deny shutdown requests based on its scheduled work load, research projects, and usage of surrounding buildings or other activities planned on campus.

- E. Noise, Vibrations, and Odors: Take extreme care to limit noise, vibrations, and odors whenever building is occupied by students, faculty, and staff. Work causing noise, vibrations, or odors that, in sole opinion of Owner's Representative, are disturbing or disruptive to students, faculty, and staff shall be re-scheduled to off-hours or when classes are not in session.

- F. Tobacco-Free Campus: Smoking of any nature and chewing of tobacco or similar products is prohibited on University property. Strictly enforce this prohibition and immediately remove offenders from Site. Such action shall not constitute grounds for a delay claim.
- G. Drug-Free Campus: The unlawful possession, use, or distribution of illicit drugs and alcohol on University property is prohibited. Strictly enforce this prohibition and immediately remove offenders from Site. Such action shall not constitute grounds for a delay claim.
- H. Persons Performing the Work – Respectful Behavior: All construction personnel shall be respectful of all members of the University community. Any incidents of disrespect, verbal abuse, threatening statements, unwelcome comments, unwelcome interaction, or any form of harassment from any construction personnel toward any member of the University community is strictly prohibited. Any such act shall be deemed sufficient cause for the University to permanently remove any individual from the project and University property, and such action shall not constitute grounds for a delay claim.
- I. Persons Performing the Work – Responsive Behavior: All construction personnel shall be responsive to requests to act on any requirements of the Contract Documents and/or to correct any endangerment to the health and safety of the public. Any individual employee who ignores or refuses to take immediate action shall be identified as generating sufficient cause for the University to permanently remove them from the project and University property, and such action shall not constitute grounds for a delay claim.
- J. Hot Work: Defined as operations involving an open flame, or that generate either sparks or hot slag or both; it includes, but is not limited to, brazing, cutting, grinding, soldering, thawing of pipes, torch applied roofing, and welding. Contact Salem Fire Department and arrange for a paid fire detail for hot work performed either indoors or on the exterior of occupied buildings or both. Restrict hot work to unoccupied periods. Ensure that all welders are properly trained and certified in the specific type of equipment they are to use.
- K. COVID -19: All construction personnel shall follow the latest CDC and Massachusetts State Guidelines for COVID -19. For specific Safety Standards and Checklists see DCAMM COVID-19 Guidance and Resources found on the [mass.gov](https://www.mass.gov) website: <https://www.mass.gov/dcamm-covid-19-guidance-and-resources>. Workers will be expected to follow the guidelines at all times.

1.13 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for style of language and intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall", "shall be", or "shall comply with", depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically

stated otherwise.

- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to Work of all Sections in Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by typical generic terms used in individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual or as detailed in Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - ~~1. Section 01 21 00 "Allowances" for products selected under an allowance.~~
 - ~~2. Section 01 23 00 "Alternates" for products selected under an alternate.~~
 - 3. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner not required to meet other Project requirements but that may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit for consideration three copies of each request. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use Construction Specifications Institute (CSI) Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including list of changes or revisions needed to other parts of Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of

- Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from Work specified.
- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses, and names and addresses of Designers and owners.
 - h. Material test reports from qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on overall Contract Time. If specified product or method of construction cannot be provided within Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Designer's Action: If necessary, Designer will request additional information or documentation for evaluation within seven calendar days of receipt of request for substitution. Designer will notify Contractor of acceptance or rejection of proposed substitution within 15 calendar days of receipt of request, or seven calendar days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Designer's Supplemental Instructions for minor changes in Work.
 - b. Use product specified if Designer does not issue a decision on use of proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected Work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 calendar days prior to time required for preparation and review of related submittals.
1. Conditions: Designer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Designer will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of Work.
 - g. Requested substitution has been coordinated with other portions of Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Designer will issue supplemental instructions authorizing minor changes in Work, not involving adjustment to Contract Sum or Contract Time, on AIA Document G710.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Owner will issue a detailed description of proposed changes in Work that may require adjustment to Contract Sum or Contract Time. If necessary, description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Owner are not instructions either to stop work in progress or execute proposed change.
 - 2. Within time specified in Proposal Request or within 14 calendar days when not otherwise specified, after receipt of Proposal Request, submit quotation estimating cost adjustments to Contract Sum and Contract Time necessary to execute the change.
 - a. Include list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include updated Contractor's construction schedule that indicates effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting extension of Contract Time.
 - e. Quotation Form: Use AIA Document G701 with material and labor backup.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to Contract, Contractor may initiate a claim by submitting a request for change to Owner.
 - 1. Include a statement outlining reasons for change and effect of change on the Work. Provide complete description of proposed change. Indicate effect of proposed change on Contract Sum and Contract Time.
 - 2. Include list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include updated Contractor's construction schedule that indicates effect of change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of Contract Time.
 - 6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use AIA Document G701 with material and labor backup.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. ~~Allowance Adjustment: See Section 01 24 00 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting Contract Sum to reflect actual costs of allowances.~~
- B. ~~Unit Price Adjustment: See Section 01 22 00 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting Contract Sum to reflect measured scope of unit-price work.~~

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, issue a Change Order for signatures of Owner's representative on AIA Document G701.

1.7 WORK CHANGE DIRECTIVE

- A. Work Change Directive: Owner may issue a Work Change Directive on AIA Document G714. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
 - 1. Submit daily logs at end of each shift to Owner for signature.

2. After completion of change, submit to Owner an itemized account and supporting data necessary to substantiate cost and time adjustments to Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. ~~Section 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.~~
 - 2. ~~Section 01 22 00 "Unit Prices" for administrative requirements governing the use of unit prices.~~
 - 3. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 4. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of Contractor's construction schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Owner at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Application for Payment.
- B. Format and Content: Use Major Work Divisions as a guide to establish line items for

schedule of values, as applicable.

1. Identification: Include the following Project identification on schedule of values:
 - a. Project name and location.
 - b. Name of Designer.
 - c. Owner's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - f. ~~Owner's Purchase Order Number.~~
2. Arrange schedule of values consistent with format of AIA Document G703.
3. Provide breakdown of Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of 10 percent of Contract Sum.
4. Round amounts to nearest whole dollar; total shall equal Contract Sum.
5. Provide separate line item in schedule of values for each part of Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance and Bill of Lading.
6. Allowances: None.
7. Purchase Contracts: Provide a separate line item in schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
8. Each item in schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in schedule of values or distributed as general overhead expense.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Submit Application for Payment to Designer by 25th day of month. The period covered by each Application for Payment is one month, ending on last day of month.
 1. Submit draft copy of Application for Payment seven days prior to due date for review by Owner and Designer.
- C. Application for Payment Forms: Use AIA Documents G702 and G703.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a

person authorized to sign legal documents on behalf of Contractor. Designer will return incomplete applications without action.

1. Entries shall match data on schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives approved before last day of construction period covered by application.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
- F. Transmittal: Submit one signed and notarized original copy of each Application for Payment to Designer by a method ensuring receipt. Application for Payment shall include waivers of liens and similar attachments.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by previous application. Waivers shall also be submitted from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Submittal schedule (preliminary if not final).
 5. Copies of permits, if applicable.
 6. Copies of authorizations and licenses from authorities having jurisdiction for performance of Work, if applicable.
 7. Initial progress report.

8. Owner's "Contractor Payment Affidavit, Release and Waiver of Liens."
 - I. Application for Payment at Substantial Completion: After Owner issues Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of Work claimed as substantially complete.
 1. Include documentation supporting claim that Work is substantially complete and statement showing an accounting of changes to Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of Work.
 - J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited to, the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to Contract Sum.
 4. Owner's "Contractor Final Payment Affidavit, Release and Waiver of Liens."
 5. Evidence that claims have been settled.
 6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of Work.
 7. Final liquidated damages settlement statement, if applicable.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
- B. Related Requirements:
 - 1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 01 70 00 "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.
 - 4. ~~Section 01 91 13 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.~~

1.3 DEFINITIONS

- A. RFI: Request from Owner, Designer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
- B. Key Personnel Names: Before starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail

addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of Specifications to ensure efficient and orderly installation of each part of Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Coordination: Coordinate construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Coordinate operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Photographic documentation.
 - 7. Preinstallation conferences.
 - 8. Project closeout activities.
 - 9. Startup and adjustment of systems.
 - 10. Track and provide documentation of all cost events including but not limited to: Change Orders, allowances, unit prices, and contingencies.

- E. Conservation: Coordinate construction activities to ensure operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

- 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

- a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
- b. Coordinate addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of information and resolution of conflicts between installed components before submitting for review.
- c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
- d. Indicate space requirements for routine maintenance and for anticipated replacement of components during life of installation.
- e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
- f. Indicate required installation sequences.
- g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Designer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

- B. Coordination Drawing Organization: Organize coordination drawings as follows:

- 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
- 2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
- 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
- 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
 - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column centerlines.
 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: Designer will review coordination drawings to confirm that Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Designer determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Designer will so inform Contractor, who shall make changes as directed and resubmit.
 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to specification.
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings or as directed by Owner or Designer.
 2. File Submittal Format: Submit or post coordination drawing in a format directed by Owner or Designer.

1.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of need for additional information or interpretation of Contract Documents, prepare and submit an RFI in the form specified.
1. Designer will return with no response RFIs submitted to Designer by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of RFI: Include a detailed, legible description of item needing information or

interpretation and the following:

1. Project name.
 2. Owner's Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Designer
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts Contract Time or Contract Sum, state impact in RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Form with substantially the same content as indicated above, acceptable to Designer.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Designer's Action: Designer will review each RFI, determine action required, and respond. Allow five business days for Designer's response for each RFI. RFIs received by Designer after 1:00 p.m. will be considered as received the following business day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in Contract Documents.
 - e. Requests for adjustments in Contract Time or Contract Sum.
 - f. Requests for interpretation of Designer's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Designer's action may include a request for additional information, in which case Designer's time for response will date from time of receipt of additional information.
 3. Designer's action on RFIs that may result in a change to Contract Time or Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in Contract Time or Contract Sum, notify Designer in writing within five business days of receipt of RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by RFI number. Submit log bi-weekly. A spreadsheet with the following information is acceptable:

1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Designer.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date RFI was submitted.
 7. Date Designer's response was received.
- F. On receipt of Designer's action, update RFI log and immediately distribute RFI response to affected parties. Review response and notify Designer within seven calendar days if Contractor disagrees with response.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Designer of scheduled meeting dates and times.
 2. Agenda: Prepare meeting agenda. Distribute agenda to invited attendees.
 3. Minutes: Designer will record significant discussions and agreements achieved at Progress Meetings, and will electronically distribute meeting minutes to Owner and Contractor. Contractor is responsible for distribution of Progress Meeting minutes to trades, Subcontractors, and materialmen engaged upon the Work.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Designer, but no later than 10 business days after execution of Agreement.
1. Conduct conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Designer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.

- p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
4. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each conference.
- C. Pre-installation Conferences: Schedule and conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer and Owner of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.

3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each conference.
 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Designer, but no later than 30 calendar days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Designer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
 4. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each conference.
- E. Progress Meetings: Schedule and conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Designer, each contractor, subcontractor, supplier, and other parties concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. Participants shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since last meeting.

Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within Contract Time.

- 1) Review schedule for next period.
- 2) Provide and review a two-week look-ahead schedule.

b. Review present and future needs, including the following:

- 1) Interface requirements.
- 2) Sequence of operations.
- 3) Resolution of BIM component conflicts.
- 4) Status of submittals.
- 5) Deliveries.
- 6) Off-site fabrication.
- 7) Access.
- 8) Site utilization.
- 9) Temporary facilities and controls.
- 10) Progress cleaning.
- 11) Quality and work standards.
- 12) Status of correction of deficient items.
- 13) Field observations.
- 14) Status of RFIs.
- 15) Status of proposal requests.
- 16) Pending changes.
- 17) Status of Change Orders.
- 18) Pending claims and disputes.
- 19) Documentation of information for payment requests.

F. Coordination Meetings: Schedule and conduct Project coordination meetings as directed by Owner or as needed. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1. Attendees: In addition to representatives of Owner and Designer, each contractor and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after

each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

- c. Review present and future needs of project, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.
 - 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Change Orders.
 - 15) Regulatory Agencies.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Special reports.
- B. Related Requirements:
 - 1. ~~Section 01 12 00 "Summary of Multiple Contracts" for preparing a combined Contractor's construction schedule.~~
 - 2. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
 - 3. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project.
 - 1. Critical Activity: An activity on the critical path that must start and finish on planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: Allocation of schedule of values for completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Designer.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and critical path of Project.
- D. Critical Path: Longest connected chain of interdependent activities through the network

schedule that establishes minimum overall Project duration and contains no float.

- E. Event: Starting or ending point of an activity.
- F. Float: Measure of leeway in starting and completing an activity.
 - 1. Float time belongs to Owner.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting planned Project completion date.
- G. Resource Loading: Allocation of manpower and equipment necessary for completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Daily Construction Reports: Submit at monthly intervals or as directed by Owner.
- G. Material Location Reports: Submit at monthly intervals or as directed by Owner.
- H. Site Condition Reports: Submit at time of discovery of differing conditions.
- I. Special Reports: Submit at time of unusual event.
- J. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: If required by Contract Documents, an experienced specialist in CPM scheduling and reporting, with capability of producing

CPM reports and diagrams within 24 hours of Designer's request.

- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review submittal requirements and procedures.
 7. Review time required for review of submittals and resubmittals.
 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 9. Review time required for Project closeout and Owner startup procedures, including commissioning activities if required.
 10. Review and finalize list of construction activities to be included in schedule.
 11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate Contractor's construction schedule with schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of Work from entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for Notice to Proceed to date of Substantial Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 10 working days, unless specifically allowed by Owner.
 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 calendar days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include in schedule review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures". Coordinate submittal review times in

- Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 5 working days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Designer's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 10 working days for completion of punch list items and final completion.
- C. Constraints: Include in schedule constraints and work restrictions indicated in Contract Documents and as follows, and show how sequence of Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 11 00 "Summary." Delivery dates indicated stipulate earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 11 00 "Summary." Delivery dates indicated stipulate earliest possible delivery date.
 6. Work Restrictions: Show effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 8. Construction Areas: Identify each major area of construction for each major portion of Work. Indicate where each construction activity within a major area must be

sequenced or integrated with other construction activities to provide for the following:

- a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
9. Other Constraints as described in Scope of Work and not included elsewhere.
- D. Milestones: Include in schedule milestones indicated in Contract Documents, including, but not limited to, Notice to Proceed, Substantial Completion, final completion, and any interim milestones described in Scope of Work and not included elsewhere.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of Work performed as of planned and actual dates used for preparation of payment requests.
1. See Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
1. Use Microsoft Project compatible with Owner's operating system.

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven calendar days of date established for Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for remainder of Work and cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 14 calendar days of date established for Notice to Proceed. Base schedule on startup construction schedule and additional information received since start of Project. Schedule shall indicate critical path of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 7. Accidents.
 - 8. Meetings and significant decisions.
 - 9. Unusual events (see special reports).
 - 10. Stoppages, delays, shortages, and losses.
 - 11. Meter readings and similar recordings.
 - 12. Emergency procedures.
 - 13. Orders and requests of authorities having jurisdiction.
 - 14. Change Orders received and implemented.
 - 15. Work Change Directives received and implemented.
 - 16. Services connected and disconnected.
 - 17. Equipment or system tests and startups.
 - 18. Partial completions and occupancies.
 - 19. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
 - 1. Material stored prior to previous report and remaining in storage.
 - 2. Material stored prior to previous report and since removed from storage and installed.
 - 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At bi-weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at each progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Designer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field office(s).
 - 2. When revisions are made, distribute updated schedules to same parties and post in same locations. Delete parties from distribution when they have completed their assigned portion of Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 5. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Designer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Designer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and serves as basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Designer and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 calendar days of construction. List those submittals required to maintain orderly progress of Work and those required early because of long lead-time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of Work covered.
 - f. Scheduled date for Designer's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled date for purchasing.
 - i. Scheduled date for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Designer's Digital Data Files: Electronic digital data files of Contract Drawings may be provided by Designer for Contractor's use in preparing submittals.
 - 1. Designer will furnish Contractor one set of digital data drawing files of Contract Drawings for use in preparing Shop Drawings and Project record drawings at no cost to Contractor or Owner.
 - a. Designer makes no representations as to accuracy or completeness of digital data drawing files as they relate to Contract Drawings.
 - b. Digital Drawing Software Program: Contract Drawings are available in AutoCAD.
 - c. Execute a data licensing agreement in form of Agreement acceptable to Owner and Designer.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Designer's receipt of submittal. No extension of Contract Time will be authorized because of failure to transmit submittals enough in advance of Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Designer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 10 business days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Designer's consultants, Owner, or other parties is indicated, allow 15 business days for initial review of each submittal.
 5. Concurrent Consultant Review: Where Contract Documents indicate submittals may be transmitted simultaneously to Designer and to Designer's consultants, allow 10 business days for review of each submittal.
- D. Paper Submittals: Shall be provided only at request of Owner with exception of samples, color charts, and other items related to visible selection of materials. Refer to Paragraph 2.1D.
1. Indicate, on label or title block, name of firm or entity that prepared each submittal.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Designer.
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Designer.
 - d. Name of Contractor.
 - e. Name of subcontractor.
 - f. Name of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
- 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).

- i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Designer observes noncompliance with provisions in Contract Documents, initial submittal may serve as final submittal.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Designer.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Designer will return without review submittals received from sources other than Contractor.
 - a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name and address of Designer.
 - 6) Name of Contractor.
 - 7) Name of firm or entity that prepared submittal.
 - 8) Names of subcontractor, manufacturer, and supplier.
 - 9) Category and type of submittal.
 - 10) Submittal purpose and description.
 - 11) Specification Section number and title.
 - 12) Specification paragraph number or drawing designation and generic name for each of multiple items.
 - 13) Drawing number and detail references, as appropriate.
 - 14) Indication of full or partial submittal.
 - 15) Transmittal number.
 - 16) Submittal and transmittal distribution record.
 - 17) Remarks.
 - 18) Signature of transmitter.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 1. Assemble complete submittal package into single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-06100.01). Resubmittals shall include an alphabetic suffix after another decimal point

(e.g.,LNHS-06100.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Designer.
4. Transmittal Form for Electronic Submittals: Use form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Designer.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Indication of full or partial submittal.
 - o. Transmittal number.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.
- F. Options: Identify options requiring selection by Designer.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Designer on previous submittals, and deviations from requirements in Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Designer's action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals marked with approval notation from Designer's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files or if directed by Designer through post electronic submittals as PDF electronic files directly to an FTP site as directed by Designer.
 - a. Designer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Action Submittals and Informational Submittals: Submit three paper copies of each submittal if requested by Designer.
 3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate in form acceptable to Designer on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.

- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 36 by 48 inches.
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Three paper copies of each submittal if requested by Owner. Designer will retain two copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality control comparisons throughout course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing full range of colors, textures, and patterns available.

- a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Designer will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
- a. Number of Samples: Submit three sets of Samples. Designer will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."
- F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."
- G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."
- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."
- J. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."
- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Designers and owners, and other information specified.
- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.
- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in Contract Documents and, where required, is

- authorized by manufacturer for this specific Project.
- N. **Manufacturer Certificates:** Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in Contract Documents. Include evidence of manufacturing experience where required.
 - O. **Product Certificates:** Submit written statements on manufacturer's letterhead certifying that product complies with requirements in Contract Documents.
 - P. **Material Certificates:** Submit written statements on manufacturer's letterhead certifying that material complies with requirements in Contract Documents.
 - Q. **Material Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in Contract Documents.
 - R. **Product Test Reports:** Submit written reports indicating that current product produced by manufacturer complies with requirements in Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by qualified testing agency, or on comprehensive tests performed by qualified testing agency.
 - S. **Research Reports:** Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
 - T. **Preconstruction Test Reports:** Submit reports written by qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in Contract Documents.
 - U. **Compatibility Test Reports:** Submit reports written by qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
 - V. **Field Test Reports:** Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in Contract Documents.
 - W. **Design Data:** Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit written request for additional information to Designer.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of Contract and for compliance with Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Designer.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with Contract Documents.

3.2 DESIGNER'S ACTION

- A. Action Submittals: Designer will review each submittal, make marks to indicate corrections or revisions required, and return it. Designer will stamp each submittal with action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Designer will review each submittal and will not return it, or will return it if it does not comply with requirements. Designer will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Designer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by Contract Documents may be returned by Designer without

action.

END OF SECTION

SECTION 014325
TESTING AGENCY SERVICES

PART I – GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the Advertisement, Bidding Documents, Contract Forms, Conditions, other Specification Sections and Drawings, all of which apply to this Section.

1.2 SUMMARY

- A. Owner will engage an independent testing agency at its own expense to perform certain testing, to confirm compliance with contract requirements and criteria described in the various Specification Sections .and as the Owner's Project Manager deems appropriate. It is the General Contractors responsibility to provide and pay for its own inspection and testing.
- B. Refer also the list of testing below, and to individual Specification Sections for the types and frequency of testing to be performed by Owner's independent testing agency.

1.3 RELATED SECTION

- A. General Conditions: Inspections and testing required by laws, ordinances, rules, regulations, or orders of public authorities.

1.4 OWNER'S TESTING AGENCY SERVICES

- A. Owner's testing agency services may include, but not be limited to, the following:
 - 1. Waterproofing.
 - 2. Firestopping.
 - 3. Hangers and supports in Divisions 21-26.
 - 4. Others as required to demonstrate compliance with Contract requirements.
- B. Each independent inspection and testing agency engaged on the project shall be authorized by authorities having jurisdiction to operate in the Commonwealth of Massachusetts.

1.5 ENGAGEMENT OF INDEPENDENT TESTING LABORATORY

- A. Owner will engage and pay for the services of independent inspectors and an independent testing agency to perform the services specified under various Sections of the Specifications.
- B. The services of a testing agency as specified in this Section is intended for the Owner's Project Manager's verification of the General Contractor's compliance with the requirements of the

Contract Documents. This shall in no way relieve the General Contractor of its responsibilities to provide its own quality control, to meet all requirements of the Contract and to provide a completed project free from construction defects.

C. Services and quantities of testing as specified herein may vary. Actual services and quantities of testing will be determined by the Owner's Project Manager and the Designer during the construction period.

D. Locations for taking sample specimens for testing shall be as directed by the Owner's Project Manager and the Designer-of-Record.

1.6 GENERAL CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with testing agency personnel and provide access to the work and to fabricator's facilities as required for the performance of their testing.

B. Provide Casual Labor and Facilities:

1. To provide access to the work to be inspected or tested.
2. To obtain and handle specimens at the site.
3. To facilitate inspections and tests.
4. To construct a storage box, on the site, of sufficient size to store cylinders which will afford protection required by ASTM C3 L

C. Shop Drawings: Provide a complete set of construction documents and shop and/or erection drawings for the items being inspected and tested.

D. Samples:

1. Provide the testing agency with preliminary representative samples of materials to be tested, in requested quantities.
2. When the source, quality, or characteristic of an approved source changes or indicates lack of compliance with contract requirements, submit additional samples of materials to testing laboratory.

E. Miscellaneous Reports, Lists: When requested by the Designer or testing agency, the General Contractor shall immediately provide copies of manufacturer/mill/fabricator reports, cutting lists, shipping bills, material bills, time and place of shipment of materials to shop and field, and any relevant data on pressure testing and investigations of materials.

F. Notification:

1. To facilitate the timely sequence of inspection and testing, the General Contractor shall give advanced notification to the testing agency and the Designer that work has progressed to the point where inspection and testing may proceed.
2. Advanced notification shall be 48 business hours (minimum) prior to commencement of activity requiring testing and inspection.

1.7 GENERAL CONTRACTOR'S QUALITY CONTROL

- A. Services of testing agency retained by Owners for verification of General Contractor's compliance and, if such tests or inspection indicates failure to comply with these Contract Documents, the General Contractor shall bear all costs associated with additional testing and inspection after the work has been corrected, to verify compliance.
- B. Provide a Quality Control Program, to the Owner's Project Manager and the Designer for their approval that includes monitoring and enforcement of the quality programs of all Subcontractors.

1.8 PATCHING

- A. Areas where samples are taken for purposes of testing shall be patched by the General Contractor to the satisfaction of the Owner's Project Manager and the Designer.

1.9 REPORTING OF RESULTS

- A. The testing agency shall document the values obtained in all tests, and shall indicate degree of compliance with the requirements of the Contract Documents. Test reports shall include the following information:
 - 1. Designer's project name and number.
 - 2. Type and location of test sample and time and date obtained.
 - 3. Type of test, ASTM or other appropriate designation.
 - 4. Result of test and degree of compliance with Contract Documents.
- B. Testing agency shall promptly distribute results of all inspections and tests as follows:
 - 1. Owner - 1 copy
 - 2. Designer- 1 copy
 - 3. Consulting Engineers (as designated by the Designer)- 1 copy
 - 4. General Contractor - 1 copy
 - 5. Subcontractor- 1 copy
- C. Notify all parties immediately in the event that test results indicate that strengths, required by the Contract Documents, will not be attained.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

End of SECTION 014325

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- ~~B. Related Requirements:
 - 1. Refer to the Scope of Work for limitations on work restrictions and utility interruptions.~~

1.3 USE CHARGES

- A. General: Include installation, removal of, and use charges for temporary facilities in Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Designer, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA, MassDEP, Construction General Permit, or authorities having jurisdiction, whichever is more stringent.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air-filtration system discharge.
 4. Waste handling procedures.
 5. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and

bottom rails. Provide concrete bases for supporting posts.

- C. Wood Enclosure Fence: Plywood, 6 feet high, framed with four 2 by 4 inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.
- D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- E. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
- F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Designer, and construction personnel office activities and to accommodate Project Meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 degrees F.
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended

location and application.

- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of Work. Relocate and modify facilities as required by progress of Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 01 11 00 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction. If connection to Owner's existing water service facilities is approved, clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore facilities to condition existing before initial use.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter equipped vacuum equipment.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
1. Install electric power service overhead unless otherwise indicated.
 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 2. Install lighting for Project identification sign, if required.
- J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line for each field office.
1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.
 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.

- e. Designer's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Designer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 31 00 00 "Earthwork."
3. Recondition base after temporary use, including removing contaminated material, regrading, proof-rolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 32 12 00 "Flexible Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or

- adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Comply with requirements specified in Section 01 74 19 "Construction Waste Management."
- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 70 00 "Execution Requirements."
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
1. Do not load elevators beyond their rated weight capacity.
 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- L. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
- M. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Security: Owner will only provide security it deems prudent and necessary for its own protection. Maintain adequate security at the Site so as not to expose the Work and surrounding property to vandalism or malicious mischief. Contractor will be issued one copy of the key(s) needed to access applicable work area(s), which must be returned upon completion of Work. Ensure upon leaving the Site at any time that all doors into areas within Contractor's control are locked and properly latched and that all other doors that may be used by Contractor are properly latched. Obtain Owner's written permission before instituting any security service.
- C. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and to minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Section 01 11 00 "Summary."
- D. Temporary Erosion and Sedimentation Control: Comply with requirements of authorities having jurisdiction.
- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- G. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- H. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- I. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

- J. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- K. Temporary Egress: Provide and/or maintain temporary egress from existing occupied facilities as indicated and as required by project phasing and/or authorities having jurisdiction.
- L. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
 - 1. Construct covered walkways using scaffold or shoring framing.
 - 2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 - 3. Paint and maintain appearance of walkway for duration of the Work.
- M. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- N. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 - 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 4. Insulate partitions to control noise transmission to occupied areas.
 - 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 6. Protect air-handling equipment.
 - 7. Provide walk-off mats at each entrance through temporary partition.
- O. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Manage fire-prevention program; comply with NFPA 241 and authorities having jurisdiction.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

P. Maintenance of Fire Alarm Systems:

1. Fire Alarm System: Maintain Owner's fire alarm system in service as required by authorities having jurisdiction.
 - a. Do not leave alarm system inoperative outside of normal business working hours without permission from authorities having jurisdiction.
2. Pay all fees associated with fire alarm disruption due to construction activity, including cost of alarm company services, fire department permits, and fire watches.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of building

enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Designer.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt, and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART I – GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements governing Contractor's selection of products for use in Project where named by specific manufacturer and/or product or described by physical properties without naming manufacturer and/or product.

B. Definitions:

1. General:

a. Definitions used in this Article are not intended to change meaning of other terms used in Contract Documents, such as, specialties, systems, structure, finishes, accessories, and similar terms.

b. Such terms are self-explanatory and have well-recognized meanings in construction industry.

2. Products;

a. Items purchased for incorporation in work, whether purchased for Project or taken from previously purchased stock.

b. The term product includes terms material, equipment, system, and terms of similar intent.

c. Named Products: Items identified by manufacturer's product name, including make or model designation, indicated in manufacturer's published product literature, current as of date of Contract Documents.

3. Materials: Products substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form part of work.

4. Equipment: Product with operational parts, whether motorized or manually operated, requiring service connections such as wiring or piping.

E. Deviations from Plans and Specifications:

M.G.L. c.30 §39I: Deviations from plans and specifications.

Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No willful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid, delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating:

1. if such deviation involves any substitution or elimination of materials, fixtures or equipment; the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor;
2. that the specified deviation does not materially injure the project as a whole;
3. that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and
4. that the deviation is in the best interest of the contracting authority.

1.2 SUBMITTALS

A. Product List Schedule:

1. Prepare Schedule showing products specified in tabular form acceptable to Architect.
2. Include generic names of products required.
3. Include manufacturer's name and proprietary product names for each item listed.
4. Coordinate Product List Schedule with Contractor's Construction Schedule and Schedule of Submittals.
5. Form: Prepare Product Listing Schedule with information on each item tabulated under following column headings.
 - a. Related Specification Section number.
 - b. Generic name as used in Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date, or time span of delivery period.

B. Submittal:

1. Within 30 days after date of commencement of work, submit 3 copies of initial Product List Schedule.
2. Provide written explanation for omissions of data, and for known variations from Contract requirements.
3. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

C. Completed Schedule:

1. Within 60 days after commencement of work, submit 3 copies of completed Product List Schedule.
2. Provide written explanation for omissions of data and for known variations from Contract requirements.

D. Architect's Action:

1. Architect will respond to Contractor in writing within 2 weeks of receipt of completed Product List Schedule.

2. No response within this time constitutes no objection to listed products or manufacturers, but does not constitute waiver of requirement that products comply with Contract Documents.
3. Architect's response will include following: List of unacceptable product selections, containing brief explanation of reasons for this action.

1.3 QUALITY ASSURANCE

- A. Source Limitations:
 2. To fullest extent possible, provide products of same kind, from single source.
 3. When specified products are available only from sources that do not or cannot produce quantity adequate to complete Project requirements in timely manner, consult with Architect for determination of most important product qualities before proceeding
 4. Qualities may include attributes relating to visual appearance, strength, structural, durability, or compatibility.
 5. When determination has been made, select products from sources that produce products possessing these qualities, to fullest. extent possible.
- B. Compatibility of Options:
- C. 1. When Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
- D. 2. Each prime Contractor is responsible for providing products and construction methods compatible with products and construction methods of other prime or separate Contractors.
- E. 3. If dispute arises between prime Contractors over concurrently selectable, but incompatible products, Architect will determine which products shall be retained and which are incompatible and must be replaced.
- F. C. Nameplates:
- G. 1. Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on exterior.
- H. 2. Labels: Locate required product labels and stamps on concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.
- I. 3. Equipment Nameplates:
- J. a. Provide permanent nameplate on each item of service-connected or power-operated equipment.
- K. b. Locate on easily accessible surface that is inconspicuous in occupied spaces.
- L. c. Nameplate shall contain following information and other essential operating data: Name of Product or Manufacturer, Model and Serial Number, Capacity, Speed, Ratings.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods to prevent damage, deterioration and loss, including theft.
- B. Delivery:
 1. Schedule delivery to minimize long-term storage at site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery and installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and. other losses.

3. Deliver products to site in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with Contract Documents, and to ensure products are undamaged and properly protected.

C. Storage:

1. Store products at site to facilitate inspection and measurement of quantity or counting of units.
2. Store heavy materials away from Project structure in manner that Will not endanger supporting construction.
3. Store products subject to damage by elements above ground, under cover in weather-tight enclosure, with ventilation adequate to prevent condensation.
4. Maintain temperature and humidity within range required by manufacturer's instructions.

PART- 2 PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements:

1. Provide undamaged products complying with Contract Documents and, unless otherwise indicated, unused at time of installation.
2. Provide products complete with all accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.
3. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures:

1. Product selection is governed by Contract Documents and governing regulations, not by previous Project experience.
2. Semi-proprietary Specification Requirements:
 - a. Where three or more products or manufacturers are named, provide one of indicated products.
 - b. Where products or manufacturers are specified by name, it is inferred terms "or equal," or "or approved equal," are included in compliance with M.G.L. Chapter 30 §39M; comply with Section 012500 concerning "substitutions" for "or equal," or "or approved equal," to obtain approval for use of unnamed product; substitutions will be processed as Change Order Requests.
3. Performance Specification Requirements:

- a. Where Specifications require compliance with performance requirements, provide products complying with these requirements, and are recommended by manufacturer for application indicated.
 - b. General overall performance of product is implied where product is specified for specific application.
 - c. Manufacturer's recommendations may be contained in published product literature, or by manufacturer's certification of performance.
4. Compliance with Standards, Codes and Regulations: Where Specifications only require compliance with imposed code, standard, or regulation, select product complying with standards, codes, or regulations specified.
5. Visual Matching:
- a. Where Specifications require matching established sample, Architect's decision will be final on whether proposed product matches satisfactorily.
 - b. Where no product available within specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of Contract Documents concerning "substitutions" for selection of matching product in another product category, or for noncompliance with specified requirements.
6. Visual. Selection:
- a. Where specified product requirements include phrase " ... as selected from manufacturer's standard colors, patterns, textures ... " or similar phrase, select product and manufacturer complying with other specified requirements.
 - b. Architect will select color, pattern, and texture from product line selected.

PART- 3 EXECUTION

3.1 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in applications indicated.
- B. Anchor each product securely in space, accurately located, and aligned with other work.
- C. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

End of SECTION 016000

SECTION 01 70 00

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- B. Related Requirements:
 - 1. Section 01 11 00 "Summary" for limits on use of Project site.
 - 2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
 - 3. ~~Section 01732 "Selective Demolition" for demolition and removal of selected portions of the building.~~
 - 4. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 5. Section 07 84 10 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and

elevation of improvements comply with requirements.

- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 business days prior to time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit three paper copies and one electronic copy signed and sealed by land surveyor.
- F. Final Property Survey: Submit three paper copies and one electronic copy signed and sealed by land surveyor showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: Professional land surveyor legally qualified to practice in jurisdiction where Project is located and who is experienced providing land-surveying services of kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Designer of locations and details of cutting and await directions from Designer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.

- f. Control systems.
 - g. Communication systems.
 - h. Fire-detection and -alarm systems.
 - i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
- a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Designer's opinion, reduce building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Designer for visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

- C. Written Report: Where written report listing conditions detrimental to performance of Work is required by other Sections, include the following:
 - 1. Description of Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.

- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

- D. Review of Contract Documents and Field Conditions: Immediately on discovery of need for clarification of Contract Documents caused by differing field conditions outside control of Contractor, submit a request for information to Designer according to requirements in

Section 01 31 00 "Project Management and Coordination."

- E. Surface and Substrate Preparation: Comply with manufacturer's written recommendations for preparation of substrates to receive subsequent work.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out Work, verify layout information shown on Drawings in relation to property survey and existing benchmarks. If discrepancies are discovered, notify Designer promptly.
- B. General: Engage land surveyor to lay out Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check location, level and plumb, of every major element as Work progresses.
 - 6. Notify Designer when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make log available for reference by Designer.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Designer. Report lost or destroyed permanent benchmarks or control points promptly. Report need to relocate permanent benchmarks or control points to Designer before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on original survey control points.

- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage land surveyor to prepare final property survey showing significant features (real property) for Project. Include on survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have final property survey recorded by or with authorities having jurisdiction as official "property survey."

3.5 INSTALLATION

- A. General: Locate Work and components of Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at time and under conditions that will ensure best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

- G. Templates: Obtain and distribute to parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Designer.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 11 00 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and

similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in new space. Provide even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven calendar days during normal weather or three calendar days if temperature is expected to rise above 80 degrees F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to level of cleanliness necessary for proper execution of Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of Work, broom-clean or vacuum entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls" and Section 01 74 19 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure no part of construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 017400

CONSTRUCTION WASTE MANAGEMENT

PART I – GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. This Section includes requirements for the Contractor's implementation of waste management controls and systems for the duration of the Work.
- B. Develop a waste management plan, quantifying material diversion by either weight or volume to recycle and/or salvage non-hazardous construction and demolition debris.

1.3 INTENT

- A. The Owner and Architect have established that this Project shall generate the least amount of waste practical and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
- B. With regard to these goals the Contractor shall develop, for the Architect's review, a Construction Waste Management Plan (CWMP) for this Project.
- C. Each Subcontractor shall be responsible for segregating his own waste into different dumpsters as directed by the Contractor.
- D. Contractor shall be responsible for ensuring that debris will be disposed of at appropriately designated licensed solid waste disposal facilities, as defined by MGL Chapter 111, Section 150A.

1.4 SUBMITTALS

- A. Waste Management Plan (WMP): Submit within 21 calendar days after receipt of Notice to Proceed, in a format acceptable to the Owner.
 - 1. Analysis of the proposed jobsite waste to be generated, including types and rough quantities.
 - 2. Landfill Options: The name of the landfills where trash and building debris will be disposed of, the applicable landfill tipping fees, and the projected cost of disposing of all Project waste in the landfills.
 - 3. Landfill Certification: Contractor's statement of verification that landfills proposed for use are licensed for types of waste to be deposited and have sufficient capacity to receive waste from this project.
 - 4. Alternatives to Landfilling: A list of each material proposed to be salvaged or recycled during the course of the Project. Include the following and any additional items proposed:
 - a. Cardboard and paper products.

- b. Clean dimensional wood.
 - c. Beverage containers.
 - d. Concrete.
 - e. Slurry wall materials.
 - f. Bricks and masonry.
 - g. Asphalt.
 - h. Metals from framing, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - i. Mechanical and electrical equipment.
 - j. Building components which can be removed relatively intact from existing construction.
 - k. Packaging materials, including cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, plastic pails.
 - l. Glass.
 - m. Scraps from new gypsum wall board.
 - n. Carpet and pad.
 - o. Acoustical ceiling panels.
 - p. Plastics.
5. Meetings: A description of the regular meetings to be held to address waste management
 6. Materials Handling Procedures: A description of the means by which any waste materials identified above will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
 7. Transportation: A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials.
- B. Waste Management Progress Reports: Concurrent with each Application for Payment, submit a written Waste Management Progress Report in the same format as required for Final Report.
- C. Waste Management Final Report: Prior to Substantial Completion, submit a written Waste Management Final Report summarizing the types and quantities of materials recycled and disposed of under the Waste Management Plan. Include the name and location of disposal facilities.
1. Material category.
 2. Generation point of waste.
 3. Total quantity of waste, by weight.
- D. Other Submittals:
1. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
 2. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
 3. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.

4. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
5. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 CONTRACTORS

- A. Contractor may subcontract work of this Section to a sub-contractor specializing in recycling and salvaging of construction waste.
 1. Eco One Solutions, LLC, Natick, MA 01760; tel. 978-270-8950; contact John Gundling, JGundling@EcoOneSolutions.com.
 2. Institution Recycling Network, Concord, NH 03301; tel. 603-229-1962; www.ir-network.com.
 3. Commercial Paving and Recycling Co. (CPRC Group), Scarborough, ME 04074; tel. 207-883-3325; www.cpcrs.com.
 4. greenGoat, Somerville, MA 02144; tel. 617-504-2095; www.greengoat.org.
- B. Gypsum Wallboard Recycling: New, paper-faced gypsum wallboard scrap (cuts from construction - not demolition waste) generated at project shall be recycled by Gypsum Recycling America, LLC. Keep scrap dry. Contact Gypsum Recycling America at 617-596-4297 or www.gypsumrecycling.us to coordinate recycling efforts.
- C. Acoustical Ceiling Panel Recycling: Demolition and construction waste pulpable mineral fiber ceiling panels may be recycled by Armstrong World Industries and US Gypsum. Contact Armstrong at 1-877-ARMSTRONG (1-877-276-7876) or www.armstrong.com or contact USG at 1-800-USG-4YOU or www.usg.com, to coordinate recycling efforts, apply for product approvals, and receive reclamation procedure requirements.
- D. Carpet Recycling: Demolition and construction waste carpet and carpet padding may be recycled by Carpet America Recovery Effort (CARE). Visit www.carpetrecovery.org to locate carpet reclaimers in local project area and reclamation procedure requirements.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement Waste Management Plan as approved by the Architect. Provide containers, storage, signage, transportation, and other items as required to implement WMP for the entire duration of the Contract.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.
- B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner and the Architect.

- C. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
- D. Separation Facilities: The Contractor shall lay out and label a specific area to facilitate separation of materials for recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Location shall be acceptable to the Architect.
- E. Hazardous Wastes: Any unforeseen hazardous wastes shall be separated, stored, and disposed of according to local regulations and as directed by the Owner.

End of SECTION 017400

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. ~~Section 01 32 33 "Photographic Documentation" for submitting final completion construction photographic documentation.~~
 - 2. Section 01 70 00 "Execution Requirements" for progress cleaning of Project site.
 - 3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 5. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating value of each listed item and reasons why Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, ~~final completion construction photographic documentation~~, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
 5. Submit test/adjust/balance records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Coordinate final changeover of permanent locks with Owner's Locksmith. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
 6. Advise Owner of changeover in heat and other utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate

visual defects.

- D. Inspection: Submit written request for inspection to determine Substantial Completion a minimum of 10 working days prior to date Work will be completed and ready for final inspection and tests. On receipt of request, Designer will either proceed with inspection or notify Contractor of unfulfilled requirements. Designer will prepare Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Designer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Designer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Designer. Certified copy of list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit written request for final inspection to determine acceptance a minimum of 10 working days prior to date Work will be completed and ready for final inspection and tests. On receipt of request, Designer will either proceed with inspection or notify Contractor of unfulfilled requirements. Designer will prepare final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at top of each page:
 - a. Project name.

- b. Date.
 - c. Name of Designer.
 - d. Name of Contractor.
 - e. Page number.
4. Submit list of incomplete items in the following format:
- a. MS Excel electronic file. Designer will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Designer for designated portions of Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 working days of completion of designated portions of Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on table of contents of Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify product or installation. Provide typed description of product or installation, including name of product and name, address, and telephone number of Installer.
 3. Identify each binder on front and spine with typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

- q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls", and Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Designer will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Designer.
 - a. Name each indexed document file in composite electronic index with applicable

- item name. Include complete electronically linked operation and maintenance directory.
- b. Enable inserted reviewer comments on draft submittals.
- 2. Three paper copies. Include complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Designer will return one copy.
- C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 10 business days before commencing demonstration and training. Designer will return copy with comments.
 - 1. Correct or revise each manual to comply with Designer's comments. Submit copies of each corrected manual within 10 business days of receipt of Designer's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.

- B. Title Page: Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Designer.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to Designer that designed systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into single binder.
- E. Manuals, Electronic Files: Submit manuals in form of multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual so that resulting bookmarks reflect system, subsystem, and equipment names in readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents; and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

- b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into separate section for each of the following:
 1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair

materials and sources, and warranties and bonds, as described below.

- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.

3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in tabular format, identify each item using appropriate references from Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."
- G. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. ~~Section 01125 "Summary of Multiple Contracts" for coordinating project record documents covering the Work of multiple contracts.~~
 - 2. Section 01 70 00 "Execution Requirements" for final property survey.
 - 3. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
 - 4. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one paper-copy set of file prints.
 - 2) Designer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and three paper-copy sets of file prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.

- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous recordkeeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, Subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in drawing technique acceptable to Designer.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Work Change Directive.
 - k. Changes made following Designer's written orders.
 - l. Details not on original Contract Drawings.
 - m. Field records for variable and concealed conditions.

- n. Record information on the Work that is shown only schematically.
 3. Mark Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Designer. When authorized, prepare full set of corrected digital data files of Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as original Contract Drawings. AutoCAD version (as specified by Owner), Microsoft Word, Excel, and Project.
 2. Format: Annotated PDF electronic file.
 3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 4. Refer instances of uncertainty to Designer for resolution.
 5. Designer will furnish Contractor one set of digital data files of Contract Drawings at no cost to Contractor for use in recording information.
 - a. See Section 01 33 00 "Submittal Procedures" for requirements related to use of Designer's digital data files.
 - b. Designer will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Designer determines that neither original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Designer for proper scale and scope of detailing and notations required to record actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file.
 3. Record Digital Data Files:
 - a. Format: AutoCAD version (as specified by Owner), Microsoft Word, Excel, and Project.

- b. Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with sheet identification. Include identification in each digital data file.
- c. Identification: As follows:
 - 1) Project name.
 - 2) Date.
 - 3) Designation "PROJECT RECORD DRAWINGS."
 - 4) Name of Designer.
 - 5) Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 - 5. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file and editable Microsoft Word files.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file.
 - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in field office apart from Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Designer's reference during normal working hours.

END OF SECTION

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including list of training modules and schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format.

1.5 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Pre-instruction Conference: Conduct conference at Project site to comply with

requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Designer.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop learning objective and teaching outline for each module. Include description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.

- c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.

8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. Designer will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 3. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. Schedule training with Owner with at least 10 business days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in completed and fully operational facility using actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

SECTION 018120

CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT

PART I – GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Requirements for minimum indoor air quality (IAQ) performance standards during the construction period and before occupancy.
 - 2. With regard to these goals the Contractor shall develop, for Owner and Architect review, a Construction Indoor Air Quality Management Plan for this Project.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 011000 - GENERAL REQUIREMENTS; Submittal requirements.
 - 2. Section 011000 - GENERAL REQUIREMENTS; Construction facilities and controls.
 - 3. Section 017400 - CONSTRUCTION WASTE MANAGEMENT.
 - 4. Division 23 - HVAC.
 - 5. Divisions 02 through 33 Specification Sections; Specific requirements relating to indoor air quality for each Section.

1.3 PERFORMANCE REQUIREMENTS

- A. Prevent exposure of building systems to environmental tobacco smoke during construction. At a minimum, take the following measures:
 - 1. Do not allow smoking in enclosed portions of the project site.
 - a. This prohibition includes electronic cigarettes.
 - 2. Locate exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows. Provide signage for designated smoking areas at each entry.
 - a. Coordinate with Owner's designated smoking areas.
- B. During construction meet or exceed the minimum requirements of the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, Second Edition, November 2007, Chapter 3.
- C. Protect absorptive materials from moisture damage when stored on-site and after installation.
- D. During construction, comply with the following requirements:
 - 1. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each

return air grille, as determined by ASHRAE 52.2-1999. Replace filtration media immediately prior to occupancy.

- E. After construction ends but before occupancy, comply with one of the following requirements:
 - 1. Perform a building flush-out with outside air.
 - 2. Conduct IAQ testing for air contaminant levels in the building.

1.4 SUBMITTALS

- A. Construction Indoor Air Quality (IAQ) Management Plan: With the completed Form of Bidder's Proposal, the Contractor shall submit a preliminary Construction IAQ Management Plan.
 - 1. Within 21 calendar days after receipt of Notice to Proceed, the Contractor shall submit to the Owner a finalized Construction IAQ Management Plan.
 - 2. The proposed Plan shall comply with Division 23 – HVAC requirements.
 - 3. The proposed Plan shall include, but not be limited to, the following:
 - a. Protection of ventilation system components during construction.
 - b. Cleaning and replacing contaminated ventilation system components after construction, including filtration media.
 - c. Temporary ventilation.
 - d. Protection of absorptive materials from moisture damage when stored on-site and after installation, including exterior wall rain protection.
 - e. Sequence of finish installation plan.
 - f. Selection of cleaning products and procedures to be used during construction and final cleaning.
 - g. Other items as required by SMACNA IAQ Guidelines for Occupied Buildings under Construction, Chapter 3.
 - 4. Coordinate Construction IAQ Management Plan with Owner's current IAQ management plans and procedures.
- B. Indoor Air Quality (IAQ) Data: Submit emission test data as required, with testing laboratory and date clearly identified.
- C. Material Safety Data Sheets (MSDS): Submit for materials as required, with date clearly identified. MSDS must contain specific chemical content data identifying the percent of the total product mass represented by each listed chemical.
- D. Product Data: Submit for each type of filtration media used during construction and installed immediately prior to occupancy, with MERV values clearly identified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Take special care to prevent accumulation of moisture on materials and within packaging during delivery, storage, and handling to prevent development of mold and mildew inside packaging and on products.
- B. Immediately remove from site and properly dispose of materials showing signs of mold and mildew, including materials with moisture stains.

PART 2 – PRODUCTS

2.1 FILTRATION MEDIA

- A. Filtration Media: Comply with ASHRAE 52.2-1999 and provide MERV as required.

PART 3 – EXECUTION

3.1 CONSTRUCTION IAQ MANAGEMENT PLAN IMPLEMENTATION

- A. IAQ Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Construction IAQ Management Plan for the Project.
- B. Distribution: The Contractor shall distribute copies of the Construction IAQ Management Plan to the Job Site Foreman, each subcontractor, the Owner, and the Architect.
- C. Instruction: The Contractor shall provide on-site instruction of appropriate procedures and methods to be used by all parties at the appropriate stages of the Project.
- D. Preconditioning: Allow products, which have odors and significant VOC emissions, to off-gas in a dry, well-ventilated space for sufficient period to dissipate odors and emissions prior to delivery to Project.
 - 1. Remove containers and packaging from materials prior to conditioning to maximize off-gassing of VOCs.
 - 2. Condition products in ventilated warehouse or other building.
- E. Coordinate Construction IAQ Management Plan with final cleaning as indicated in Section 011000, GENERAL REQUIREMENTS..

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.
- B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner and the Architect.
- C. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
- D. Separation Facilities: The Contractor shall lay out and label a specific area to facilitate separation of materials for recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Location shall be acceptable to the Architect.
- E. Hazardous Wastes: Any unforeseen hazardous wastes shall be separated, stored, and disposed of according to local regulations and as directed by the Owner.

End of SECTION 018120

SECTION 024100

DEMOLITION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included:

1. Demolition and removal of selected portions of buildings and structures and as required for new work. Refer to the Drawings for additional requirements.
2. Salvage of existing items to be reused or turned over to the facility.
3. Removal and legal disposal of demolished materials off site. Except those items specifically designated to be relocated, reused, or turned over to the facility, all existing removed materials, items, trash and debris shall become property of the Contractor and shall be completely removed from the site and legally disposed of at their expense. Salvage value belongs to the Contractor. On-site sale of materials is not permitted.
4. Demolition and removal work shall properly prepare for alteration work and new construction to be provided under the Contract.
5. Scheduling and sequencing operations without interruption to utilities serving occupied areas. If interruption is required, obtain written permission from the utility company and the Owner.

- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 011000 - GENERAL REQUIREMENTS for temporary facilities and controls, for maintenance of access, for cleaning during construction, and for dust and noise control.
2. Section 017400 - CONSTRUCTION WASTE MANAGEMENT for waste management and recycling.
3. Section 018120 - CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT for indoor air quality control procedures.
4. Section 210001 - FIRE PROTECTION:
 - a. Disconnecting, capping and otherwise making inactive existing fire protection services in areas where demolition and removal work is required.
 - b. Disconnect and reinstallation of fire protection equipment temporarily interrupted during construction.
5. Section 220001 - PLUMBING:
 - a. Disconnecting, capping and otherwise making inactive existing plumbing services in areas where demolition and removal work is required.
 - b. Disconnection and reinstallation of plumbing equipment temporarily interrupted during construction.
6. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING:
 - a. Disconnecting, capping and otherwise making inactive existing HVAC services in areas where demolition and removal work is required.

- b. Disconnect and reinstallation of HVAC equipment temporarily interrupted during construction.
- 7. Section 260001 - ELECTRICAL WORK:
 - a. Disconnecting, capping and otherwise making inactive existing electrical services in areas where demolition and removal work is required.
 - b. Disconnect and reinstallation of electrical equipment temporarily interrupted during construction.
- 8. Section 311000 – SITE CLEARING:
 - a. Excavating and removal of existing pavement, sub-surface building and utility structures and lines, appurtenances, and other elements indicated on the Drawings.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to the Owner ready for reuse, at a location designated by the Owner. Protect from weather until accepted by Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated. Protect from weather until reinstallation.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain property of the Owner as applicable. Carefully remove each item or object in a manner to prevent damage and deliver promptly to a location acceptable to the Owner.

1.5 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with early and late starting and finishing dates for each activity. Ensure Owner's on-site operations are uninterrupted if applicable.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other occupants affected by selective demolition operations.
 - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 7. Means of protection for items to remain and items in path of waste removal from building.
- B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged, and turned over the Owner.

- C. Predemolition Video and Pictures: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 requirements. Submit before Work begins.

1.6 QUALITY ASSURANCE

- A. Examination of Existing Conditions: The Contractor shall examine the Contract Drawings for demolition and removal requirements and provisions for new work. Verify all existing conditions and dimensions before commencing work. The Contractor shall visit the site and examine the existing conditions as he finds them and shall inform herself/himself of the character, extent and type of demolition and removal work to be performed. Submit any questions regarding the extent and character of the demolition and removal work in the manner and within the time period established for receipt of such questions during the bidding period.
- B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Section 011000 - GENERAL REQUIREMENTS, Project Meetings. Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 SALVAGING

- A. Salvaged for Reinstallation: Materials indicated on the Drawings to be salvaged and reinstalled shall be carefully removed and stored at a location acceptable to the Architect and Owner.

- B. Salvaged for Storage: Materials indicated on the Drawings or designated in the field by the Owner to be salvaged and stored shall be carefully removed and delivered to the Owner at locations determined by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer registered in the state that the project is located to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction videotapes.
 - 1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies and Owner.
 - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.
 - 4. Prior to commencing cutting work in existing surfaces, take all precautionary measures to assure that mechanical and electrical services to the particular area have been made inactive. Coordinate with Fire Suppression, Plumbing, HVAC, and Electrical subcontractors. Only licensed tradesmen of that particular trade shall disconnect and

cap existing mechanical and electrical items that are to be removed, abandoned and/or relocated.

5. If, during the process of cutting work, existing utility lines are encountered which are not indicated on the Drawings, regardless of their condition, immediately report such items to the Architect. Do not proceed with work in such areas until instructions are issued by the Architect. Continue work in other areas.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Comply with requirements for access and protection specified in Section 011000 - GENERAL REQUIREMENTS, Temporary Facilities and Controls.
 2. Maintain adequate passage to and from all exits at all times. Before any work is done which significantly alters access or egress patterns, consult with the Architect and obtain approval of code required egress. Under no condition block or interfere with the free flow of people at legally required exits, or in any way alter the required condition of such exits.
- B. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.
 2. Remove temporary shoring, bracing and structural supports when no longer required.
 3. Post warning signs and place barricades as applicable during placement and removal of temporary shoring.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area(s).
 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Provide temporary barricades as required to limit access to demolition areas.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Maintain clear unimpeded passage through the work area for safety and emergency egress.
 10. Saw cut overruns in concrete and masonry for new door, window and other finish openings is not permitted. Core drill corners and finish square to match required opening.
 11. Dispose of demolished items and materials promptly.
 - a. Comply with requirements in Section 017400 - CONSTRUCTION WASTE MANAGEMENT.
- B. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to storage area designated by the Owner.
 5. Protect items from damage during transport and storage.
- C. Removed Items for Reinstallation by the Respective Trade.
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to storage area designated by the Owner.
 5. Protect items from damage during transport and storage.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- E. Items for Re-use and Preservation of Existing Surfaces to Remain:
1. The Contractor shall inspect closely each item specifically designated to be relocated, re-used, or turned over to the Owner prior to its removal, and immediately report damages and defects to the Architect and the Owner. The Contractor shall be responsible for any subsequent damage to the same other than latent defects not readily apparent from close inspection, and shall bear responsibility for its repair or same replacement as directed by the Architect, to the satisfaction of the Owner.
 2. Unless special surface preparation is specified under other Specification Sections, leave existing surfaces that are to remain in a condition suitable to receive new materials and/or finishes.

3.5 PROTECTION OF PUBLIC AND PROPERTY

- A. Provide all measures required by federal, state and municipal laws, regulations, and ordinances for the protection of surrounding property, the public, workmen, and Owner's employees during all demolition and removal operations. Measures are to be taken, but not limited to installation of sidewalks, sheds, barricades, fences, warning lights and signs, trash chutes and temporary lighting.
- B. Protect all walks, roads, streets, curbs, pavements, trees and plantings, on and off premises, and bear all costs for correcting such damage as directed by the Architect, and to the satisfaction of the Owner.
- C. Demolition shall be performed in such a manner that will insure the safety of adjacent property. Protect adjacent property from damage and protect persons occupying adjacent property from injuries which might occur from falling debris or other cause and so as not to cause interference with the use of other portions of the building, of adjacent buildings or the free access and safe passage to and from the same.
- D. Every precaution shall be taken to protect against movement or settlement of the building, of adjacent buildings, sidewalks, roads, streets, curbs and pavements. Provide and place at the Contractor's own expense, all necessary bracing and shoring in connection with demolition and removal work.
- E. Remove portions of structures with care by using tools and methods that will not transfer heavy shocks to existing and adjacent building structures, both internal and external of the particular work area.
- F. Provide and maintain in proper condition, suitable fire resistive dust barriers around areas where interior demolition and removal work is in progress. Dust barriers shall prevent the dust migration to adjacent areas. Remove dust barriers upon completion of major demolition and removal in the particular work area.

3.6 DISCOVERY OF HAZARDOUS MATERIALS

- A. If hazardous materials, such as chemicals, asbestos-containing materials, or other hazardous materials are discovered during the course of the work, cease work in affected area only and immediately notify the Architect and the Owner of such discovery. Do not proceed with work in such areas until instructions are issued by the Architect. Continue work in other areas.
- B. If unmarked containers are discovered during the course of the work, cease work in the affected area only and immediately notify the Architect and the Owner of such discovery. Do not proceed with work in such areas until instructions are issued by the Architect. Take immediate precautions to prohibit endangering the containers integrity. Continue work in other areas.

3.7 CUTTING

- A. Perform all cutting of existing surfaces in a manner which will ensure a minimal difference between the cut area and new materials when patched. Use extreme care when cutting existing surfaces containing concealed utility lines which are indicated to remain and bear full responsibility for repairing or replacement of all such utilities that are accidentally damaged.
- B. Provide a flush saw cut edge where pavement, curb and concrete removals abut new construction work or existing surfaces to remain undisturbed.

- C. All slurry and water shall be contained and managed to avoid damage to existing conditions when using a wet saw or wet core driller.
- D. Obtain and pay for a hot work permit and arrange to have on-site a Fire Watch when using a cutting torch or similar item.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Comply with requirements of Section 017400 - CONSTRUCTION WASTE MANAGEMENT and the following:
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Premises shall be left in a clean condition and ready to accept alteration work and new construction.

END OF SECTION

028200 - ASBESTOS ABATEMENT

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 that are hereby made a part of this Section.
- B. For the purpose of this Section, the following definitions apply:
"Site" shall refer to the Administration Building, located on the campus of Salem State University, 352 Lafayette Street, Salem, Massachusetts
"Contractor" shall refer to the Asbestos Abatement Contractor
"Architect" shall refer to Jones Architecture, Inc.
"Consultant" shall refer to EFI Global, Inc.
"ACM" shall refer to asbestos-containing material
"ACWM" shall refer to asbestos-containing waste material

1.02 RELATED REQUIREMENTS

- A. Examine the Project Drawings prepared by the Architect and all other specification sections for requirements affecting the work of this Section whether or not such work is specifically mentioned in this Section.
- B. 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.

1.03 DESCRIPTION OF WORK

A. PROJECT DESCRIPTION

The Contractor shall furnish all labor, materials, equipment, and services for the proper removal and disposal of all specified asbestos-containing materials and asbestos-contaminated materials, as outlined in the specifications and Project Drawings.

- 1. The project involves the removal of ACM and ACWM on the roof of the site building as described below. The Contractor is responsible for removal and disposal of all ACM and ACWM.

The types and estimated quantities of ACMs to be removed as part of this project are as follows:

**Scope of Work for Asbestos Abatement
 Administrative Building
 Salem State University, Salem, Massachusetts**

Description of Work	Material Location	Estimated Quantity
Remove and properly dispose of asbestos-containing black flashing mastic. Removal of flashing mastic shall be conducted utilizing the procedures described in 310 CMR 7.15(10).	Administration Roof	50 SF
Remove and properly dispose of asbestos-containing grey sealant on brick flashing. Removal of sealant shall be conducted utilizing the procedures described in 310 CMR 7.15(10).	Connector Roof	120 LF

Description of Work	Material Location	Estimated Quantity
Remove and properly dispose of asbestos-containing black mastic on HVAC flashing. Removal of mastic shall be conducted utilizing the procedures described in 310 CMR 7.15(10).	Boiler Plant Roof	20 SF
Remove and properly dispose of asbestos-containing brown window glazing. Removal of mastic shall be conducted utilizing the procedures described in 310 CMR 7.15(11).	Boiler Plant Roof	100 LF

SF – Square Foot LF – Linear Foot

Note – the three locations (Boiler Plant, Connector, and Administration Roofs) are interconnected and are collectively known as the “Administration Building Roof” for the purposes of this project.

2. Bidders are required to verify the quantities of all materials prior to the bid deadline, including the dimensions and locations of areas requiring abatement as well as the types of materials to be abated. If further investigation time is required for the quantity verification, arrangements shall be made as needed. This estimation shall be performed prior to the submission of the bid. Bidders shall inform the Consultant and the Architect of any discrepancies between the quantities and types of materials specified herein and those verified to be present by the Bidder. If appropriate, an adjustment shall be made as to the types and/or quantities to be included in the Bid. If no discrepancies with the types and/or quantities of materials to be abated are brought to the attention of the Consultant and the Architect prior to the Bid due date, it will be understood that the Bidders are in agreement with the types and quantities of materials specified herein, and no change orders will be allowed for these materials.
3. Pre-cleaning and disposal of any debris generated by the work shall also be conducted in each work area and around the ground surface below abatement areas. Refer to the Project Drawings for specific locations of ACM and ACWM.
4. In the event that additional (currently obscured) types and/or quantities of materials are to be removed, the Contractor shall refer to the Unit Pricing Section for applicable unit pricing to be used in the work of this project. Unit prices shall be submitted as specified in the Bid Forms of this specification. No change orders shall be granted for the types of materials identified in this specification. For a material to be verified as an extra, the Contractor shall notify the Consultant and the Architect of the conditions believed to warrant a claim, prior to the disturbance of the material. The Consultant and the Architect shall field verify the Contractor’s claim, and if deemed an extra, the contract price shall be adjusted by the unit price or through negotiation. No claims for any increase in the contract price shall be considered if the material has been removed by the Contractor without prior authorization by the Consultant and the Architect.
5. The locations of the ACM and ACWM depicted on the Project Drawings are approximate only. The Contractor is responsible for identification, field verification, and removal of all ACM and ACWM specified.
6. The Contractor is responsible for selective demolition to access, investigate, and remove all ACM and ACWMs specified. The Contractor shall include in the base bid all costs for selective demolition to access all ACM and ACWM identified herein.

B. GENERAL SCOPE OF WORK

The following is the General Scope of Work at a minimum, required to be performed by the Contractor for asbestos abatement work in each of the work areas identified below. The Contractor shall adhere to the Scope of Work outlined below and depicted by the drawings as well as any additional requirements stated herein.

1. Work area preparation, including pre-cleaning, installation of critical barriers and polyethylene sheeting, construction of decontamination facilities, and other activities as directed by the Consultant or the Architect.
2. Removal of asbestos containing black flashing mastic, grey sealant on brick flashing, and black mastic on HVAC flashing, utilizing the procedures described in 310 CMR 7.15(10).
3. Removal of asbestos containing brown window glaze, utilizing the procedures described in 310 CMR 7.15(11).
3. Removal and disposal of all specified ACM, ACWM, asbestos contaminated materials and non-asbestos containing materials as specified on the Project Drawings.
4. Encapsulation of all abated surfaces in each work area.
5. Furnishing of all labor, materials, equipment, insurance, and services required for all work included in this specification.
6. Compliance with all applicable federal, state, and local regulations, as well as, all requirements set forth in these specifications.
7. Decontamination, teardown, and clean up following abatement activities.
8. Performance of any other work or activities required by this specification, applicable regulations, or as necessary to perform a complete job to the satisfaction of the Owner, Architect, and Consultant.
9. The Consultant reserves the right to collect samples of any suspect ACM and ACWM in order to verify that the asbestos has been satisfactorily removed by the Contractor in accordance with the Specifications.

C. SPECIFIC SCOPE OF WORK

The following Work shall be conducted for this project. Examine all Project Drawings and specifications for full extent and location of work to be conducted.

1. General Building Areas
 - a. Coordinate this work with other contractors at the site, the Architect and the Consultant. Coordinate all system shutdowns with the Consultant, Architect, and Owner in advance.
2. Refer to the Bid Forms for the scope of work required by unit prices and the pricing of same. Unit prices shall be part of the base bid and shall be utilized for less or more ACM and ACWM addressed in the Contract Documents.

D. PROJECT SCHEDULE

The project shall begin as soon as the 10 business day notifications take effect and upon receipt of written authorization to proceed from the Owner and the Architect. The Contractor is responsible to complete work in each building area as specified on the Project Drawings.

Completion of work includes obtaining satisfactory visual clearance and tear down of each work area.

1.04 SEQUENCE OF WORK

The following provisions shall apply for asbestos abatement work as identified by this section. The Contractor shall apply these provisions to all work areas throughout the buildings.

- A. The Contractor shall decontaminate, remove and properly dispose of all specified ACM and ACWM located throughout each identified work area.
- B. Prior to the commencement of the work, a remote three-chambered decontamination unit shall be erected at the entrance to the roof. The three chambered decontamination unit shall consist of a clean room, a shower room, and an equipment room.
- C. All work shall be performed in accordance with all federal, state, and local regulations governing asbestos abatement. The Contractor shall assume full responsibility and liability for compliance with all applicable federal, state, and local regulations pertaining to work practices, hauling and disposal of asbestos waste, and protection of workers, visitors to the work site, and persons occupying areas adjacent to the work site.
- D. The scheduling and sequencing of the Work of this Contract shall be determined by the Architect and the Owner.

1.05 WORK INCLUDED

The total scope of work shall not be based solely on the information provided in this specification. The Contractor is required to perform quantity take-offs and measurements of the amount of material to be removed using all Drawings and based on a site visit.

1.06 SUBMITTALS

- A. Before preparations are allowed to begin, the Owner, Architect, and Contractor shall submit the following to the Consultant for approval:
 1. Copies of all notifications, permits, applications, licenses, and like documents required by federal, state, or local regulations obtained or submitted in proper fashion;
 2. Copies of Contractor's DLS licenses for asbestos;
 3. A proposed timetable for the complete job that shows the preparation, removal and disposal, clean up, testing, and teardown portions of the job for each work area. A critical path showing completion dates for each area shall be included;
 4. Proof of the abatement supervisor's certification and training, including the most recent refresher course completed and current DLS certifications for asbestos;
 5. Proof of each asbestos abatement worker's certification and training, including the most recent refresher courses completed and current DLS certifications for asbestos;
 6. Written site-specific Respiratory Protection Program for employees throughout all phases of the job, including make, model and NIOSH approval numbers of respirators to be used on this specific job;
 7. Proof that the asbestos abatement supervisor and workers have been fit-tested within the past twelve months for using both a negative-pressure respirator equipped with HEPA filter cartridges and a PAPR;

8. Proof that the abatement supervisor and workers have been examined by a qualified physician within the past 12 months, and are capable of wearing respiratory protection and are able to perform asbestos abatement work and other related activities;
 9. Chain of Command of responsibility at work site including supervisors, foreman, and competent person, their names, and resumes;
 10. Proposed Emergency Plan and route of egress from work areas in case of fire or injury, including the name, directions/map and phone number of nearest medical assistance center;
 11. The name and address of the Contractor's personal air monitoring and testing laboratory including certification of Massachusetts DLS accreditation.
 12. Name, address, and ID number of the asbestos waste hauler, and proposed disposal site(s);
 13. Any other documentation that applies and is called for by this or other sections of the specifications;
 14. No work on the project will be allowed to begin until Owner, Architect, and Consultant as listed herein approve the Pre-Job Submittals. Any delay caused by the Contractor's refusal to submit this documentation in a timely manner does not constitute a cause for change order or a time extension;
 15. Contractor's written site-specific Health and Safety Plan that includes Hazcom, Respiratory Protection, and Lockout/Tagout with site-specific written plans; and,
- B. Upon completion of the asbestos abatement work, the Contractor shall submit the following to the Consultant for approval:
1. All manifests and landfill receipts detailing disposal of all asbestos and asbestos-containing waste materials generated by the work.
 2. All analytical results of personal asbestos air samples collected in accordance with OSHA regulations to verify that the 8-hour time weighted average (TWA) concentrations of asbestos fibers in the breathing zone of the workers has not exceeded the permissible exposure limit (PEL) of 0.1 f/cc.

1.07 TRAINING AND QUALIFICATIONS

A. Worker Training

All workers on this project shall be Massachusetts Department of Labor Standards (MassDLS) certified as Asbestos Workers, and shall have proper training and experience, , at a minimum, on the following topics:

1. The health hazards of asbestos including the nature of asbestos related diseases, routes of exposure, known dose-response relationships, the synergistic relationship between asbestos exposure and cigarette smoking, latency periods, and health basis for standards.
2. Personal protective equipment including the types and characteristics of respirator classes, limitations of respirators, proper selection, inspection, donning, use, maintenance and storage of respirators, field testing the face piece to face seal (positive and negative pressure fit tests), qualitative and quantitative fit testing procedures, variations between laboratory and field fit factors, factors that affect respirator fit, selection and use of disposable clothing, use and handling of washable clothing, non-skid shoes, gloves, eye protection, and hard hats.

3. Medical monitoring requirements for workers including required and recommended tests, reasons for medical monitoring and employee access to records.
4. Air monitoring procedures and requirements for workers including description of equipment and procedures, reasons for monitoring, types of samples and current standards with recommended changes.
5. Work practices for asbestos and hazardous materials abatement including purpose, proper construction and maintenance of airtight plastic barriers, job set-up of airlocks, posting of warning signs, electrical and ventilation system lockout, proper working techniques, waste clean-up, storage and disposal.
6. Personal hygiene including entry and exit procedures for the work area, use of showers and prohibition of eating, drinking, smoking, and chewing in the work area.
7. Special safety hazards that may be encountered including electrical hazards, air contaminants (CO, wetting agents, encapsulants), fire and explosion hazards, scaffold and ladder hazards, slippery surfaces, confined spaces, heat stress, and noise.
8. Workshops allowing both supervisory personnel and abatement workers the opportunity to observe and experience the construction of containment barriers and decontamination facilities.
9. Lockout/Tagout and Confined Space Entry procedures.

B. Site Supervisor Qualifications

1. The Contractor shall provide one Site Supervisor, whose responsibilities include coordination, safety, security, and execution of all phases of the asbestos abatement project. The Site Supervisor shall have current MassDLS certification as an Asbestos Supervisor, will not be used as an abatement worker and will be assigned full-time to the project.
2. The Site Supervisor shall be fully qualified and trained in all aspects of asbestos abatement practices and procedures. The asbestos training course will cover all topics listed above as well as training in contract specifications, liability insurance and bonding, legal considerations related to abatement, establishing respiratory protection medical surveillance programs, EPA and OSHA record-keeping programs, as well as any other topics requested by the Owner.
3. At least one licensed asbestos supervisor should be on site at all times who is certified in CPR and Emergency First Aid by an appropriate authority, as well as having received the required training under the OSHA Bloodborne Pathogen Standard.

1.08 REGULATORY SUBMITTALS

- A. The Contractor shall notify the following agencies in appropriate manner and place of impending work, and shall provide evidence of notifications at the pre-construction meeting:
1. Massachusetts Dept. of Environmental Protection
205 Lowell Street
Wilmington, Massachusetts 01887
(10 business days in advance)
 2. Massachusetts Division of Occupational Safety
Department of Labor Standards
1001 Watertown Street
West Newton, Massachusetts 02165

(10 business days in advance)

3. Local Fire and Police Departments, Building Department, and other state or town agencies as required by law or ordinance.

B. Permits

The Contractor shall be responsible for securing and paying for all necessary permits for asbestos related work, including hauling, removal and disposal, building, cut and torch, fire watch, and materials usage, sidewalk Police and Fire details, or any other permits required to perform the specified work.

C. Fees, Licenses, Patents, and Copyrights

1. The Contractor shall pay all licensing fees, royalties, and other costs necessary for the use of any copyrighted or patented product, design, invention, or process in the performance of the job specified herein. The Contractor shall be solely responsible for costs, damages, or losses resulting from any infringement of these patent rights or copyrights.
2. The Contractor shall hold the Owner, Architect, and the Consultant harmless from any costs, damages, and losses resulting from any infringement of these patent rights or copyrights.
3. If the Contract Specification requests the use of any product, design, invention, or process that requires a licensing fee or royalty fee for use in the performance of the job, the Contractor shall be responsible for the fee or royalty fee and shall disclose the existence of such rights.
4. The Contractor shall be responsible for costs of all licensing requirements, where applicable, and notification requirements and all other fees related to the Contractor's ability to perform the work in this section.

1.09 SAFETY CONSIDERATIONS

- A. This project is subject to compliance with Public Law 91-596, "Occupational Safety and Health Act of 1970" (OSHA), with respect to all Rules and Regulations pertaining to construction, including Volume 36, Numbers 75 and 105, of the Federal Register, as amended, and as published by the U.S. Department of Labor.
- B. In addition to any detailed requirements of the Specification, the Contractor shall at his own cost and expense comply with all laws, ordinances, rules and regulations of Federal, State, Regional and Local Authorities regarding handling and storage of asbestos, lead and other hazardous waste materials.
- C. All staging and scaffolding (if needed) shall be furnished and erected by the Contractor in accordance with all applicable requirements and be maintained in safe condition by him at no additional cost to the Owner.
- D. The Contractor is responsible for using safe procedures to avoid electrical hazards. When a hazard exists, work will be stopped, and power will be shut off and checked before work begins again. All electrical panels and exposed wires within the work site shall be de-energized prior to the commencement of any wetting or removal operations. All extension cords and power tools used within the work area shall be attached to Ground Fault Circuit Interrupters (G.F.C.I.) in accordance with 1910.120 and the Contractor's Lockout/Tagout and Confined Space Entry programs.

1.10 SECURITY

- A. The Owner will provide specific access as required during the project to the Contractor and personnel assigned to the project. The access shall be determined by the Owner and the Architect. The Contractor shall maintain security in the building using appropriate secure barriers and locks. It will also be the Contractor's responsibility to allow only authorized personnel into each work area, and to secure all assigned entrances and exits at the end of the workday. Authorized personnel include licensed Contractor staff, the industrial hygienist, and all other personnel with the appropriate training, medical approval, respirator fit testing, and personal protective equipment. The Contractor shall cover each window, door, grate, or other opening made by abating these components with secured plywood coverings to prevent unauthorized access into the building.
- B. Any person entering or leaving the contained areas must sign the Contractor's bound logbook and enter the date and time. The logbook must be located immediately outside the entrance to the Decontamination Unit at all times and be open for inspection by the Consultant.

1.11 REFERENCES

The following references are cited as applicable publications:

- A. Environmental Protection Agency
Asbestos Regulations (NESHAPS) Title 40 CFR Part 61, as currently amended. Guidance for Controlling Friable Asbestos Containing Materials in Buildings, Final Rule and Notice. Asbestos Hazard Emergency Response Act (AHERA) Title 40 CFR Part 763.
- B. Occupational Safety and Health Administration
Title 29 CFR 1910.1001 (amended)
Title 29 CFR 1926.1101 (amended)
Title 29 CFR 1926.62 (amended)
- C. Commonwealth of Massachusetts
Department of Labor and Workforce Development
453 CMR 6.00, The Removal, Containment, or Encapsulation of Asbestos
- D. Commonwealth of Massachusetts
Department of Environmental Protection
310 CMR 7.15
- E. U.S. Department of Transportation Regulations
49 CFR Parts 172 and 173
- F. All regulations by these and other governing agencies in their most recent version are applicable. These specifications refer to many requirements found in these references, but in no way intend to cite or reiterate all provisions therein or elsewhere. It is the Contractor's responsibility to know, understand, and abide by all such regulations and common practices.
- G. Other provisions contained in these references may from time to time during the execution of this contract be enforced by the Owner at his own discretion.
- H. Toxic Substances and Control Act (TSCA) (40 CFR 761).
- I. Massachusetts Waste Disposal Regulations (310 CMR 7.15).
- J. Hazard Communication Standard (29 CFR 1926.59).

- K. Hazardous Waste Operations and Emergency Response (29 CFR 1910.120).
- L. National Contingency Plan (CERCLA, Section 105).
- M. Spill Prevention Control and Countermeasures Plan (40 CFR, Part 112).

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

The Contractor shall provide new materials and new or used equipment in undamaged and serviceable condition. Only materials and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards, are to be used during the project.

A. Fire Extinguishers

The Contractor shall provide multi-purpose ABC minimum rating to A40BC fire extinguishers. The Contractor shall comply with the applicable recommendations of NFPA Standard 10 "Standard for Portable Fire Extinguishers." Fire extinguishers shall be located where they are most convenient and effective for their intended purpose but provide not less than one extinguisher inside each work area in the Equipment Room and one outside each work area in the Clean Room.

B. Construction Lumber

Construction lumber for critical barrier walls shall consist of nominal, fire-retardant, 2" x 4" framing, sixteen inches center to center.

C. Plastic Sheeting

The Contractor shall provide non-combustible, fire-retardant, 6-mil thick clear, frosted, or black plastic sheeting in the largest size possible to minimize seams in accordance with local fire department requirements. Spray plastic will not be allowed for use on this project.

D. Adhesive Materials

The Contractor shall provide duct tape in 2" or 3" widths, with an adhesive that is formulated to aggressively stick to plastic sheeting. The Contractor may also provide spray adhesive in aerosol cans that is specifically formulated to stick tenaciously to plastic sheeting.

E. Shower Assembly

1. The Contractor shall provide a leak tight shower enclosure with integrated drain pan fabricated from fiberglass or other durable waterproof material, approximately 3' x 3' square with minimum 6' high sides and back. The Contractor shall structurally support the unit as necessary for stability and equip it with a hose bib, mounted at approximately 4'-0" above drain pan.
2. The Contractor shall provide a factory-made showerhead producing a spray of water that can be adjusted for spray size and intensity. The Contractor shall feed shower with water mixed from hot and cold supply lines, arranged so that control of water temperature, flow rate, and shutoff is from inside shower without outside aid.
3. The Contractor shall provide a totally submersible waterproof sump pump with an integral float switch. The unit shall be sized to pump two times the flow capacity of all showers or hoses supplying water to the sump, through the filters specified herein when they are loaded to the extent that replacement is required. The unit shall be capable of pumping debris,

sand, plaster or other materials washed off during decontamination procedures without damage to mechanism of pump. The Contractor shall adjust float switch so that a minimum of 3" remains between top of liquid and top of sump pan.

F. Negative Air Filtration System

The Contractor shall provide air-filtering equipment capable of filtering particles to 0.3 micrometers at 99.97% efficiency and of sufficient quantity and capacity to cause a complete air change within the work area at least once every 15 minutes. Such equipment shall exhaust the filtered air so as to maintain a negative pressure inside the work area. Air shall flow in through the Decontamination Unit and exhaust through the negative air filtration unit by means of flexible duct leading outside the work area, preferably outside of the building. Negative air filtration shall be in operation at all times.

G. HEPA Vacuum

The Contractor shall utilize high efficiency filter vacuums to filter particles of 0.3 micrometers or larger at 99.97% efficiency or greater. The Contractor shall obtain HEPA vacuum attachments, such as various size brushes, crevice tools, and angular tools to be used for varied application, and service the HEPA vacuum routinely to assure proper operation. Caution shall be used any time the vacuum is opened for HEPA filter replacement or debris removal. Operators shall wear protective clothing and respirators when using the HEPA vacuum. Vacuuming by conventional means is unacceptable.

H. Amended Water

For wetting prior to disturbance of asbestos-containing materials, the Contractor shall use an amended water solution. The Contractor shall provide water to which a commercial surfactant (i.e., not dish detergent) has been added. The Contractor shall use a mixture of surfactant and water, which results in wetting of the asbestos-containing material and retardation of fiber release during disturbance of the material, equal to or greater than that provided by the use of one ounce of a surfactant, consisting of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with five gallons of water.

I. Disposal Bags

The Contractor shall provide appropriately labeled 6-mil thick leak tight plastic bags of sufficient size for application.

J. Water Service

All temporary water connections to the Owner's water system shall include back-flow protection. The Contractor shall provide heavy-duty abrasion-resistant hoses with a pressure rating greater than the maximum pressure of the water distribution system to provide water into the work area and to the Decontamination Unit. The Contractor shall provide a UL rated 40-gallon electric hot water heater to supply hot water for each Decontamination Unit shower.

K. Electrical Service

1. The Contractor shall provide temporary power service to the Decontamination Unit sub panel with minimum 60-amp, 2 pole circuit breaker or fused disconnect connected to the auxiliary power source. The sub panel and disconnect shall be sized and equipped to accommodate all electrical equipment required for completion of the work. The Contractor shall comply with

applicable NEMA, NECA, and UL standards and governing regulations for materials and layout of temporary electric service.

2. The Contractor shall provide identification-warning signs of voltage differences at power outlets that are other than 110-120 volt power and provide polarized outlets for plug-in type outlets, to prevent insertion of 110-120 volt plugs into higher voltage outlets. Dry type transformers shall be provided where required to provide voltages necessary for work operations.
3. The Contractor shall provide receptacle outlets equipped with ground-fault circuit interrupters (GFCI), with reset button and pilot light, for plug-in connection of power tools and equipment. No electrically powered tools or equipment shall be operated without a Ground-Fault Interrupter. The Contractor shall provide the Consultant with documentation proving that the GFCI's are in proper working order.
4. The Contractor shall use only grounded extension cords. Use "hard-service" cords where exposed to abrasion and traffic. Single lengths of electric cord shall be used, or waterproof connectors shall be used to connect separate lengths of electric cords, if single lengths will not reach areas of work.
5. The Contractor shall provide general service incandescent lamps of wattage required for adequate illumination (in accordance with OSHA 29 CFR 1910.56, "Illumination"). Lamps shall be equipped with guard cages or tempered glass enclosures where fixtures are exposed to breakage by construction operations. Exterior fixtures shall be provided where fixtures are exposed to the weather or moisture.

PART 3 - PROJECT EXECUTION

3.01 GENERAL CONSIDERATIONS

A. Approvals and Inspection

All temporary facilities, work procedures, equipment, materials, services, and agreements must strictly adhere to and meet these contract specifications along with EPA, OSHA, NIOSH, regulations and recommendations as well as any other federal, state, and local regulations. Where there exists overlap of these regulations, the most stringent one applies. All work performed by the Contractor is further subject to approval of the Consultant. Modifications to these isolation and sealing methods, procedures, and design may be considered if all elements of proper and safe procedures to prevent contamination and exposure can be demonstrated. Written modifications to these specifications must be made to the Consultant for review before they can be used for work on this project.

B. Damage and Repairs to The Work Site

The Contractor shall provide protection of these items and materials as part of the work area preparation. The Contractor shall not perform any demolition activity that could result in the loss of integrity of any building or equipment-related structural member. Where asbestos abatement activity causes damage, the Contractor shall patch, repair, replace or otherwise restore same to its original condition at no additional cost to the Owner.

C. HVAC Systems

Wherever possible, shut down and lock out/tag out electric power to all work areas. Provide temporary power and lighting according to these specifications. Coordinate with the Consultant in advance prior to conducting shutdowns and lockouts. Whenever the work area cannot be completely de-energized, the Contractor will provide the Consultant with a plan for protecting workers and electrical equipment. Shut down and lock out all heating, cooling, and air conditioning system (HVAC) components that are within, supply, or pass through the work area. This will be done with the advice and counsel of the Consultant, but the Contractor is responsible to ensure all systems are shut down and it is impossible to re-energize until clearance is obtained.

1. Investigate the work area and agree on pre-abatement condition with the Owner.
2. Seal all intake and exhaust vents in the work area with tape and 2 layers of 6-mil polyethylene.
3. Seal any seams in system components that pass through the work area.
4. Remove all HVAC system filters and place in labeled, 6-mil polyethylene bags for staging and eventual disposal as asbestos-contaminated waste.

D. Barriers and Isolation Areas

1. The Contractor shall construct and maintain suitable critical barriers to separate work areas from spaces occupied by the Owner or other tradesmen. Critical barriers shall be of sufficient size and strength to prevent building occupants, the public, and others from entering the work areas.
2. Warning signs shall be posted on all critical barriers at the commencement of the work area preparation, as required in 1926.1101 of the Occupational Safety and Health Standards.
3. The signs shall display the proper legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in OSHA Standard 1926.1101. The signs will read as follows:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATOR AND PROTECTIVE CLOTHING
REQUIRED IN THIS AREA

4. The signs shall be posted at the perimeters of asbestos removal, demolition or construction areas where the asbestos-containing material to be removed exists.
5. The Contractor shall maintain all temporary and critical barriers, facilities and controls as long as necessary for the safe and proper completion of the work. All containments shall consist of floors and walls covered with 2 layers of 6-mil poly sheeting, except in those instances where such floors are deemed impervious by the Consultant.
6. Any breaches in the containment will be corrected at the beginning of each shift and as necessary during the workday. Work will not be allowed to commence until all control systems are in place and operable.

7. No barriers shall be removed until the work areas are thoroughly cleaned, and all debris has been properly bagged and removed from work areas, and the air has passed final clearance tests, in accordance with provisions detailed herein.

3.02 ACM & ACWM LOCATION PREPARATION AND REMOVAL

A. Area Preparation

1. PRIMARY BARRIERS: Prior to the construction of each asbestos abatement area, all primary barriers shall be sealed with a minimum of one layer of 6-mil plastic sheeting and duct tape. Primary barriers consist of all windows, vents, closed and locked doors, and openings to adjacent spaces from the work area. Plywood shall be utilized to cover any doors, elevators, or other entrances to the work area(s) that may be accessible by unauthorized personnel.

B. Decontamination Unit and Procedures

1. It is the Contractor's responsibility to provide decontamination chambers consisting of a Clean Room, Shower Room, and Equipment Room for personnel and waste/equipment involved in asbestos abatement. Each of the three rooms shall be of sufficient size to accommodate authorized personnel. Shower shall be completely functional as described in 3.02 (B)(7).
2. Each room shall be separated from other rooms by a double flap of 6-mil polyethylene sheeting acting as an airlock. This shall be designed to minimize fiber migration and airflow between the decontamination unit rooms. A separate equipment and waste decontamination unit shall also be constructed. This can be adjacent to the personnel shower room.
3. The rooms shall be framed with 2" X 4" lumber, masked, sealed and attached to the entry/exit ways of asbestos/lead work areas.
4. The rooms together shall be referred to as the Decontamination Unit. A Decontamination Unit will be required for each separate containment area, if work is to be divided into sections.
6. The Equipment Room shall serve as a transfer room for decontamination procedures to occur in. This room shall be vacuumed and washed whenever necessary in order to prevent asbestos dust and debris accumulations or when required by the Consultant. Workers leaving the containment shall remove and dispose of disposable protective suits in the Equipment Room and proceed into the Shower Room.
7. The Shower Room shall contain an appropriate number of shower heads supplied with hot and cold water adjustable at the tap. Uncontaminated soap, shampoo, and towels shall be available at all times. The shower water shall be drained, collected, and filtered through a system with at least 5.0-micron particle size collection capability. A system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtration system by large particles. Filtered wastewater shall either be discharged in accordance with the applicable local codes or otherwise disposed of as asbestos waste. Contaminated filters shall be disposed of as asbestos waste.
8. The Clean Room shall store abatement workers' clean protective clothing and clean respirator equipment. Contaminated clothing, respirators, tools, equipment, or other materials shall not be allowed into the Clean Room or beyond. The Clean Room will serve as an access for personnel entering the work area, and for the donning of respiratory protection

and protective clothing. The Contractor shall provide space in the Clean Room for the workers' personal clothing. This shall be in the form of lockable lockers.

C. ACM & ACWM Removal – General Procedures

1. Asbestos removal will not begin until the Architect and Consultant have given authorization to proceed. This authorization will be given after the removal area has passed a visual inspection by the Consultant based on the criteria presented herein. The Owner reserves the right to inspect the work area prior to start of abatement. The Owner also reserves the right to inspect the work area at any time and to order the Contractor to stop work.
2. All materials shall be sufficiently saturated/wetted to reduce fiber release so that the airborne fiber concentration does not exceed the established OSHA Permissible Exposure Limits (PEL's).
3. Dry removal and dry sweeping will not be permitted at any time during this project.
4. All asbestos-containing material shall be carefully removed and placed into double 6-mil polyethylene bags or fiber drums for disposal. All bags, containers or wrapped materials transported out of the work area shall be labeled with preprinted labels required by Federal EPA, OSHA and the Department of Transportation regulations. The name of the waste generator (Owner) and the project location address shall also be placed on each bag/drum.
5. Fine cleaning of residual asbestos-containing material shall consist of carefully scraping or brushing the material from surfaces. The recommended method for brushing a substrate after gross removal has taken place is to use a nylon brush. Wetting of the substrate shall also occur while this brushing is performed, since the chance of airborne fiber generation during fine cleaning still exists.
6. Air testing may be performed continuously outside the asbestos work areas by the Owner's Consultant. If fiber concentrations exceed 0.010 fibers/cc, or background levels, work shall stop, and the Contractor shall perform clean-up activities in the affected areas and check the integrity of all barriers.
7. Clean-up activities shall include but not be limited to wet-wiping and vacuuming surfaces with a HEPA equipped vacuum. Work may continue only after the source of contamination is identified, corrected, and proper cleaning activities are implemented.
8. Air testing may be performed by the Consultant on site in the affected areas (if warranted). If the results of these air tests are not below 0.010 fibers/cc, the Contractor shall perform a thorough decontamination of the affected areas.
9. After brushing and scraping, surfaces shall be free of visible debris and fibers. A final wipe-down of the substrate with wet, lint-free cloths shall take place in order to ensure proper cleaning. All surfaces shall also be HEPA vacuumed clean.
10. All visible asbestos-containing material is to be removed by the Contractor. The removal substrate must be clean and bare, and the entire work area must be free and clear of any suspect material for the Contractor to pass this visual inspection and begin encapsulation.

D. ACM Removal Procedures – Asbestos-Containing Asphaltic Roofing and Siding

1. If the requirements of 310 CMR 7.15(10) are followed, asbestos-containing asphaltic roofing and siding may be disposed of in any landfill permitted by the MassDEP to accept solid waste pursuant to 310 CMR 19.000: Solid Waste Management.

2. Roof level heating and ventilation air intakes shall be isolated by covering the intakes with 6-mil thickness plastic sheeting prior to the start of removal work.
3. Asphaltic roofing materials shall be removed intact to the greatest extent feasible.
4. Asphaltic roofing materials that are not intact or will be rendered non-intact shall be adequately wet during removal.
5. Where cutting machines are used in the removal of asphaltic roofing materials, said cutting machines shall be equipped with a HEPA vacuum to capture dust produced by the cutting process. Cutting machines that are not equipped with a HEPA vacuum to capture dust produced by the cutting process shall only be used inside the work area for which containment sufficient to prevent visible emissions of fugitive dust to the ambient air has been established.
6. Where cutting machines are used in the removal of asphaltic roofing materials, the material shall be adequately wetted throughout the cutting process.
7. Dust produced by power roof cutters operating on aggregate surfaces shall be removed by HEPA vacuuming. Dust produced by power roof cutters operating on non-aggregate, smooth surfaces shall be removed by HEPA vacuuming or wet wiping along the cut line.
8. Asbestos containing asphaltic roofing materials shall not be dropped or thrown to the ground. Unless the material is carried or passed to the ground by hand, it shall be lowered to the ground by crane or hoist or transferred in dust-tight chutes.
9. Intact asbestos containing asphaltic roofing materials shall be lowered to the ground prior to the end of each work shift. Non-intact asbestos containing asphaltic roofing materials shall be kept adequately wet at all times while on the roof. Non-intact asbestos containing asphaltic roofing materials shall be placed in an impermeable waste bag (6-mil thickness) or wrapped in plastic sheeting (minimum 6-mil thickness), sealed with duct tape or equivalent, and lowered to the ground prior to the end of each work shift.
10. For activities that disturb friable ACM, no visible emissions shall be discharged to the outside air during the collection, processing, or transporting of any ACM or ACWM.

E. ACM Removal Procedures – Asbestos-Containing Window Glazing Removal

1. A work area defined at 310 CMR 7.15(1) shall be established that extends outward from the exterior side of the building or facility where the abatement work that will result in disturbance of asbestos-containing glazing compounds is to take place. Said work area shall be large enough to encompass all areas where dust, debris or waste generated during the operation are expected to accumulate and areas where there is a reasonable possibility that airborne levels of asbestos could be elevated, as well as any area occupied by equipment.
2. Windows, doors, and other openings on the side of the building where the abatement work that will result in the disturbance of asbestos-containing glazing compounds shall be closed while the work is occurring and air conditioners on the same side of the building shall be turned off.
3. Tarpaulin of plastic sheeting shall be spread on the ground under the windows being abated. Said tarpaulin or plastic sheeting shall extend away from the edge of the building and to

either side of the work area a sufficient distance to catch any debris generated by the work operation. Tarpaulin or sheeting shall be cleaned of accumulated debris no later than the end of each work shift.

4. If the entire sash is to be removed during abatement operations, window openings shall be sealed on the inside of the building with 6-mil thickness polyethylene sheeting in a manner sufficient to prevent leakage of dust or debris to interior spaces. When less than an entire sash is to be replaced, covering and sealing of interior surfaces of the sash that encompasses the area of the panes being worked on may be performed in lieu of sealing the entire sash.
5. Prior to commencing removal of asbestos-containing glazing compound, the exterior and interior window well and sash areas shall be pre-cleaned by HEPA-vacuuming and/or wet wiping.
6. Asbestos containing glazing compound shall be adequately wet with amended water prior to removal. All pieces or particles of glazing compound shall be removed using a HEPA vacuum and/or using a wet wipe collection method.
7. The work area, including ground covers and equipment, shall be cleaned of visible debris at the end of each workday.
8. Upon completion of the removal of asbestos-containing glazing, the sash and sill areas shall again be cleaned by HEPA-vacuuming and/or wiped with a wet sponge or cloth. Polyethylene sheeting (where used) shall be removed from the interior of the window and disposed of as ACWM in accordance with 310 CMR 7.15 (15) through (18), and the window well shall be cleaned by HEPA vacuuming and/or wet wiping.
9. All equipment utilized in the work operation shall be cleaned of visible dust and debris by HEPA-vacuuming and/or wet wiping prior to removal from the work area.
10. The tarpaulin/plastic sheeting below the window(s) shall be cleaned of visible dust and debris by HEPA vacuuming and/or wet wiping. Dry sweeping is not allowed. Ground covers that are free of visible debris shall be disposed of as ACWM.
11. Barrier tape may be disposed of as solid waste in accordance with 310 CMR 19.000: Solid Waste Management.
12. Disposable protective clothing shall be disposed as ACWM in accordance with 310 CMR 7.15 (15) through (18).
13. Wetted glazing and other ACM/ACWM shall be collected and sealed into a 6-mil plastic bag that is placed in a leak tight container for disposal as ACWM in accordance with 310 CMR 7.15 (15) through (18).
14. If the entire sash is to be removed and disposed of as ACWM, then the adequately wetted sash shall be removed intact, wrapped in a minimum of two layers of 6-mil polyethylene sheeting with all seams and joints sealed with duct tape.
15. At the conclusion of work, the work area shall be inspected for any ACM/ACWM dust or debris. The work area shall be re-cleaned until no visible debris is found.
16. All waste shall be labeled as ACWM prior to removal from the work area.
17. Visual inspection of the work area required by 310 CMR 7.15(8) shall be conducted by the Asbestos Project Monitor.

18. For activities that disturb friable ACM, no visible emissions shall be discharged to the outside air during the collection, processing, packaging, or transporting of any ACM or ACWM.

F. Encapsulation Procedures

1. The polyethylene barriers shall be cleaned of gross contamination before a lockdown sealant can be applied to the substrate.
2. After the substrate has been cleaned and all polyethylene barriers of the work area are cleaned of all visible debris, the Contractor shall request a visual inspection of the work area by the Consultant.
3. Workers performing lockdown must wear disposable protective clothing and respirators suitable for asbestos. The encapsulation process shall not be treated any differently from the removal process in this respect.
4. All surfaces from which asbestos-containing materials have been removed shall be encapsulated. A minimum of one coat of lockdown encapsulant will be applied to both the substrate and the polyethylene sheeting serving as the containment barrier. If the lockdown material is being applied to irregular, grooved, or corrugated surfaces, it shall be administered from the opposing side, or at a right angle to the direction of the previous application.
5. The encapsulant shall be left to dry before the commencement of final air testing. After final clearance and inspection criteria have been met, the Contractor shall begin final take-down procedures.

G. Removal of Critical Barriers

1. No critical barrier shall be taken down until the final visual inspection and final clearance air tests (were required) are found to be below 0.010 fibers/cc by PCM.
2. After a successful final visual inspection, encapsulation, and a successful final air test (where required), the Contractor shall conduct the post abatement takedown.
3. All encapsulated polyethylene sheeting used in the construction of the Decontamination Unit and Containment Area shall be bagged and disposed of as asbestos contaminated waste.
4. Areas exposed during this process shall be examined for traces of suspect material.
5. If any is found, it will be picked up by HEPA vacuuming and wet cleaning, and a coat of encapsulant shall be applied to the affected areas. Based on the amount of suspect material found, the Consultant may request the use of misters in the surrounding area.
6. The Contractor will then implement the use of misters as a precautionary measure.

3.03 DISPOSAL OF ASBESTOS WASTE (ACWM)

- A. All waste removal procedures shall be conducted in accordance with local, state and federal regulations.
- B. The Contractor shall provide proof that disposal sites for all waste materials have current and valid permits to accept specific wastes at the time of the pre-construction meeting.
- C. Receipts shall be obtained by the Contractor from the disposal/recycling site(s) and submitted to the Consultant upon request for final payment.

- D. Warning labels having permanent, waterproof print and adhesive shall be affixed to all asbestos bags, trucks, drums (lids and sides), and other containers used to store and/or transport asbestos-containing material. Labels must be conspicuous and legible and contain the following warning:

CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

- E. The Contractor shall be responsible for all necessary precautions to prevent pollution by spilling during the performance of services and shall assume full responsibility for all Contractor caused spills, which shall be cleaned up at the Contractor's expense.
- F. Temporary storage of asbestos waste on-site (inside) will be allowed in designated non-work areas only.

3.04 SCRAP METALS REMOVAL

- A. Precious, semi-precious, and scrap metals, including, but not limited to, copper, aluminum, silver, gold, brass, and steel shall not be cut and removed from the Site by the Abatement Contractor unless specifically required by the Asbestos Abatement provisions of these specifications and by written authorization from the Owner and Architect.

3.05 HOUSEKEEPING

- A. Throughout the work period, the Contractor shall maintain the building and site in a standard of cleanliness as specified throughout these specifications.
1. Contaminated disposable clothing, respirator filters, and other debris shall be bagged and sealed at the end of each workday.
 2. All asbestos generated by either removal or repair shall be bagged immediately and not be allowed to be left exposed at the end of each workday.
 3. Respirators shall be thoroughly cleaned at the end of each workday and stored for the next day's use.
 4. The Contractor shall retain all stored items in an orderly arrangement allowing maximum access, not impeding traffic, and providing the required protection materials.
 5. The Contractor shall not allow the accumulation of scrap, debris, waste material, and other items not required for completion of the work.
 6. The Contractor shall provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the environment.
 7. Daily, and more often if necessary, the Contractor shall inspect the work areas and adjoining spaces, and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
 8. The Contractor shall maintain the site in a neat and orderly condition at all times.

3.06 QUALITY CONTROL

- A. The Owner has retained the Consultant, to provide project administration, monitoring of Contractor work practices and performance, inspection of the work sites, bulk fiber identification, and air sampling and analysis throughout the asbestos and hazardous materials abatement project.

B. Many references to Owner will in fact be managed by the Consultant in lieu of the Owner, at the Owner's request, and the Contractor is required to regard the requests and interpretations of the Consultant as having full force unless expressly informed otherwise by the Owner.

C. Air Monitoring

1. The air clearance acceptance criteria (where required) for this project is <0.010 fibers per cubic centimeter of air (f/cc) by Phase Contrast Microscopy (PCM) using the NIOSH 7400 Method.
2. Background (pre-testing) air and appropriate dust samples may be taken to represent conditions before the Contractor starts masking and sealing operations.
3. During removal, area samples may be collected by the Owner's Consultant outside major openings in the containment: in the clean room, at other critical points outside the work areas, just outside the clean room, and inside the contained work sites. The Contractor shall be responsible for all OSHA personal sampling. Where necessary, final clearance air samples will be collected inside each removal area after acceptance of visual inspection and encapsulation.

D. Work Review

1. The Consultant and the Architect will review the Contractor's work practices prior to the start of, and during all asbestos related work, and will report any specification violations to the Contractor. If the Contractor fails to correct deficiencies in a timely manner, the Contractor will be notified in writing, and work may be stopped.
2. The Consultant will review the work area preparations before work begins and after the Contractor Site Supervisor has given approval. Outside work area airborne fiber concentrations must not exceed 0.010 fibers/cc or pre-abatement levels, whichever is greater.
3. If concentrations exceed this level, then work must be stopped, conditions reviewed as to the probable cause, and then corrected. A description of procedures regarding fiber concentrations greater than 0.010 fibers/cc outside the work area can be found above.
4. The Consultant will keep a daily log of the Contractor's work practices and will make these daily logs a part of the final project documents.

3.07 PERSONAL PROTECTION

A. Respirators and Protective Clothing

1. Protective Clothing

- a. Personal protection, in the form of disposable Tyvek suits, and NIOSH approved respirators, are required for mechanics, Contractor supervision, Owner, Consultant, and visitors at the work site during the set-up, removal, and cleaning operations.
- b. The Contractor shall provide all this protective equipment for workers, Owner, Consultant, and authorized personnel to access this work site.
- c. Each worker shall be supplied with a minimum of two complete disposable uniforms every day.

- d. Removal workers shall not be limited to two uniforms, and the Contractor will be required to supply additional uniforms as is necessary. Under no circumstances will anyone entering the removal area be allowed to reuse a contaminated uniform.
- e. Work clothes shall consist of disposable full body suits, head covers, gloves, footwear, and eye protection. Street clothes are forbidden in the work area at all times, even under protective suits.

2. Respiratory Protection

- a. The Contractor shall supply workers and supervisory personnel with NIOSH approved protective respirators and HEPA filters.
- b. Appropriate respirator selection shall be determined by the daily personal samples being taken and strictly follow the guidelines set forth in the OSHA respiratory program 29 CFR 1910.134 and the Massachusetts DLS Regulations 453 CMR 6.00. The respirators shall be sanitized and maintained according to the manufacturer's specifications. Appropriate respirators shall be selected using the information provided in OSHA Title 29 CFR Part 1910.1926 Final Rules. This determination has been made for this project. The Contractor shall utilize full-face Powered-air Purifying (PAPR) respirators equipped with HEPA filters for all work. Disposable respirators shall not be considered acceptable in any circumstance.
- c. The Contractor will maintain on site a sufficient supply of disposable HEPA filters to allow workers and supervisory personnel to change contaminated filters at least three (3) times daily. The Contractor is solely responsible for means and methods used and for compliance with applicable regulations.
- d. Respirators shall be individually assigned to removal workers for their exclusive use.
- e. All respiratory protection shall be provided to workers in accordance with the written submitted respiratory protection program, which includes all items in OSHA 29 CFR 1910.134 (b) (1-11). A copy of this program shall be kept at the work site and shall be posted in the Clean Room of the Decontamination Unit.
- f. Workers must perform negative and positive pressure fit tests each a time a respirator is put on, whenever the respirator design permits.
- g. Workers shall be given a qualitative fit test in accordance with procedures detailed in the OSHA 29 CFR 1910.1025, Appendix D, Qualitative Fit Test Protocols, for all respirators to be used on this abatement project. An appropriately administered quantitative fit test may be substituted for the qualitative fit test.
- h. Upon leaving the active work area, the pre-filter shall be discarded, cartridges removed, and respirators cleaned in disinfectant solution and clean water rinse. Clean respirators shall be stored in plastic bags when not in use. The Contractor shall inspect respirators daily for broken, missing, or damaged parts.

3. Personal Sampling

- a. The Contractor shall provide daily personal sampling to check personal asbestos exposure levels for the purpose of establishing respiratory protection needs.
- b. Samples shall be taken for the duration of the work shift or for eight hours, whichever is less.

- c. Personal samples need not be taken every day after the first day if working conditions remain consistent but must be taken every time there is a change in the removal operation, either in terms of the location or the type of work, or during any changes in personnel. Sampling will be to determine eight-hour Time Weighted Averages (TWA). The Contractor is responsible for personal sampling as outlined in OSHA Standard 1926.1101.
- d. Sampling personnel shall be proficient in the taking of asbestos air samples as prescribed by NIOSH 7400, and must be supervised by an individual who has completed the NIOSH 582, or equivalent, training course.
- e. Asbestos air sampling results shall be available for posting at the job site in written form no more than twenty-four (24) hours after the completion of a sampling cycle. The document shall list each sample's result, sampling time and date, individual monitored, flow rate, sampling duration, microscope field area, number of fibers per fields counted, cassette size, and analyst's name and company. Air sample analysis results will be reported in fibers per cubic centimeter.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following work:
 - 1. Repair of Damaged Concrete
 - 2. Grouting of bolt holes in precast concrete
 - 3. Coordination with and cutting and patching of mechanical, electrical, plumbing, and fire protection penetrations through concrete.
 - 4. Installation of the following items as furnished by the designated sections:
 - a. Not Applicable
- B. Related Sections Include the Following:
 - 1. Section 03 4000 Precast Concrete

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
 - 2. Indicate amount of fly ash in the mix.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
 - 1. Indicate coordination requirements for reinforcement locations with requirements of structural steel, steel joints, and steel deck.
- D. Formwork Inspection: Indicate compliance with approved drawings.
- E. Anchor Bolt Location: Indicate compliance with approved shop drawings.

- F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates.
 - 2. Material Certificates: For each of the following, signed by manufacturers:
 - 3. Cementitious materials.
 - 4. Admixtures.
 - 5. Form materials and form-release agents.
 - 6. Steel reinforcement and accessories.
 - 7. Fiber reinforcement.
 - 8. Waterstops.
 - 9. Curing compounds.
 - 10. Floor and slab treatments.
 - 11. Bonding agents.
 - 12. Adhesives.
 - 13. Vapor retarders.
 - 14. Semi-rigid joint filler.
 - 15. Joint-filler strips.
 - 16. Repair materials.
- G. Floor surface flatness and levelness measurements to determine compliance with specified tolerances and requirements for applied finishes and materials, except as noted for slope to drains.
- H. Field quality-control test and inspection reports.
- I. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- D. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 -PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: shall be American-made Portland Cement, free from water soluble salts or alkalis which will cause efflorescence on exposed surfaces. Portland Cement shall be Type II, ASTM C150. Use only one brand of cement for each type of cement throughout project. Contractor shall be responsible for whatever steps are necessary to insure that no visual variations in color will result in exposed concrete and shall place on order and secure in advance a sufficient quantity of this (these) cement(s) to complete concrete work specified herein.
1. Fly Ash: ASTM C 618
 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normalweight Fine Aggregate: shall be washed, inert, natural sand conforming to ASTM C33 and following additional requirements:

Sieve Retained Percent

#4 0 - 5

#16 25 - 40

#50 70 - 87

#100 93 - 97

Fineness Modulus 2.80 (Plus/Minus 0.20)

Organic Plate 2 maximum

Silt 2.0 percent maximum

Mortar Strength 100 percent minimum compression ratio

Soundness 5 percent maximum loss, magnesium sulfate, five cycles

- C. Normalweight Coarse Aggregate: shall be well graded crushed stone or washed gravel conforming to ASTM C33 and the following additional requirements:

Designated Size

(inches)	3	2	1-1/2	1	3/4	1/2	3/8
F.M.(+/-0.20)	7.95	7.45	7.20	6.95	6.70	6.1	4.5

Organic Plate 1 Maximum

Silt 1.0 percent Maximum

Soundness 5 percent maximum loss, magnesium sulfate, five cycles

Maximum designated sizes for normalweight coarse aggregate to be used in concrete sections shall be as noted below, except that sizes shall also be chosen in conjunction with required clearances.

1. One and one-half inches for sections over ten inches in thickness.
2. One inch for sections more than eight and up to ten inches in thickness.
3. Three-quarter inch for sections more than three and up to eight inches in thickness.

- D. Lightweight and Fine and Course Aggregates: shall be a rotary kiln expanded shale and conform to ASTM C330 and as specified herein. Aggregate sizes shall include fine aggregate designated as "sand size", and course aggregate designated as graded three quarter inch in size and three eighth inch in size.

- E. Concrete Fill for Steel Stair and Landing Pans: shall be composed of 1:2:2 mix with three-eighths inch maximum size normalweight aggregate and shall be placed with a 0 inches to 1 inch slump.

- F. Water: shall be from approved source, potable, clean and free from oils, acids, alkali, organic matter and other deleterious material.

- G. Admixtures:

1. Water-reducing agent:

- a. "WRDA" - W.R. Grace & Co.
- b. "PDA25" - Protex Industries, Inc.
- c. "Pozzolith 344H" - Master Builder's Co.
- d. Note: Water-reducing agent shall be by same manufacturer as air-entraining agent.

2. Air-entraining agent:

- a. "DAREX AEA" - W.R. Grace & Co.
- b. "PROTEX AEA" - Protex Industries
- c. "MB-VR" or "MB-AE" - Master Builder's Co.

3. Superplasticizer: High-range water-reducer conforming to ASTM C494, Type F or Type G.

4. Admixtures retarding setting of cement in concrete shall not be used without written approval of Designer.

5. Admixtures causing accelerated setting of cement in concrete shall not be used without written approval of Designer.

2.2 CONCRETE MIXTURES

- A. The Contractor shall recommend, on the basis of trial mixes and strength curves specified below, design mixes for each type and strength of concrete. The Testing Agency will verify that the proposed mix designs conform to all specification requirements.
- B. Sufficient materials for concrete mix design shall be furnished by Contractor not less than five weeks before use. Duplicate small samples plainly and neatly labeled with source, where proposed to be used, date, and name of collector shall be provided and presented to Testing Agency for permanent reference.
- C. Mixes shall be designed in accordance with "Method 1" of ACI 301, and the requirements of this Section. All concrete is normalweight unless specifically designated otherwise; air-dry weight not to exceed 150 lbs. per cubic foot.
- D. Limiting values shown below apply for specific strengths of concrete with coarse aggregates less than one and one-half inches unless noted otherwise in TABLE A below.

Table A		
Minimum Allowable Compressive Strength 28 Days (psi)	Maximum Allowable water/cement Ratio*	Minimum Permissible Cement Content (lbs)**
4500	.45	642
4000	.48	602
* Maximum; decrease if possible. This represents total water in mix at time of mixing, including free water on aggregate.		
** Minimum; increase as necessary to meet other requirements.		

- E. In all slabs and walls exposed to weather, all concrete shall contain the approved air-entraining admixture as per manufacturer's written instructions, to provide entrained air, by volume, in the cured concrete within 4.5 to 6.5 percent.
- F. Water-Reducing Admixture - The approved water-reducing admixture shall be used in all concrete, in accordance with manufacturer's written instructions.
- G. Concrete slabs, including slabs on grade, shall have a maximum water cement ratio of 0.45.
- H. The approved superplasticizer shall be used in all concrete slabs, including slabs on grade.
- I. Water content and cement content of concrete to be used in work shall be based on curve showing relation between water content, cement content, and 7 and 28 day compressive strengths of concrete made using proposed materials. Curves shall be determined by four or more points, each representing an average of at least three test specimens at each age, and shall have range of values sufficient to yield desired data, including all compressive strengths required by Contract Documents, without extrapolation. Design mix of concrete to be used in work, as determined from curve, shall correspond to following test strengths (TABLE B) obtained in laboratory

trial mixtures, but in no case shall resulting mix conflict with limiting values as specified in TABLE A.

Table B Minimum Strength of Lab Trial Mixes (psi)		
Design Strength (psi)	Trial Mix Strength (7 days)	Trial Mix Strength (28 days)
4500	4300	5500
4000	3800	5000

- J. Concrete shall be proportioned to contain Fly Ash at the rate of 25% of the total cementitious material by weight. For concrete containing Fly Ash, the water-cement ratio shall be calculated as water divided by cement plus Fly Ash.
- K. Any deviation from approved mix design, which Contractor deems desirable under certain project conditions, will not be allowed without written approval of Designer. Cost of any additional testing by Testing Agency associated therewith shall be paid for by Contractor.

2.3 FORM MATERIALS

- A. Construct formwork to shapes, lines, and dimensions required, plumb and straight, secured and braced sufficiently rigid to prevent deformation under load, and sufficiently tight to prevent leakage, all in conformance with ACI Standard 347, "Recommended Practice for Concrete Formwork".
- B. Formwork for exposed concrete shall be medium-density plastic overlaid plywood, 5/8" minimum thickness; for concealed concrete shall be "Plyform" plywood, 5/8" minimum thickness.
- C. Chamfer Strips: Half-inch, 45 degree poplar wood strips, nailed six inches on center, and installed in inside corners of all forms, unless otherwise directed by Designer.
- D. Form Ties and Spreaders: Richmond Tyscrus by Richmond Screw Anchor Co.; Superior-ties by Superior Concrete Accessories, Ind.; or Sure-Grip Ties by Dayton Sure-Grip and Shore Co. Wire ties shall not be used. Ties for foundation walls shall be snap-ties or type specified above with removal cones and shall incorporate water seal washer. Ties shall be arranged in a symmetrical manner.
- E. Form Release Agent: Non-staining and non-emulsifiable type, or equal approved by Designer. Form release agent shall be biodegradable and shall not impart any stain to concrete nor interfere with adherence of any material to be applied to concrete surfaces.

2.4 REINFORCEMENT AND ACCESSORIES

- A. Reinforcing Steel Bars: shall be newly rolled billet steel conforming to ASTM A615 Grade 60. Bars shall be bent cold.
- B. Welded Wire Fabric: shall conform to ASTM A185.
- C. All structural steel reinforcement and embedded items shall be hot-dip galvanized after fabrication in accordance with ASTM A123.

- D. All hot-dip galvanized steel shall be inspected for compliance with ASTM A123 and shall be marked with a stamp that indicates the number of ounces of zinc per square foot of steel. After galvanizing, the bars shall be dipped in a 0.2 percent chromic acid solution. A notarized Certificate of Compliance with all of the above shall be required from the galvanizer.
- E. Reinforcement Accessories: shall conform to Product Standard PS7-766, National Bureau of Standards, Department of Commerce, Class C, as produced by Superior Concrete Accessories, Inc.; Dayton Sure-Grip Co.; or R.K.L. Building Specialties Co., Inc. Reinforcement accessories shall include spacers, chairs, ties, slab bolsters, clips, chair bars, and other devices for properly assembling, placing, spacing, supporting, and fastening reinforcement. Tie wire shall be galvanized or stainless wire of sufficient strength for intended purpose, but not less than No. 18 gage. Metal supports shall be of such type as not to penetrate surface of formwork and show through surface of concrete. Accessories touching interior formed surfaces exposed to view shall have not less than 1/8 inch of plastic between metal and concrete surface. Plastic tips shall extend not less than 1/2 inch up on metal legs. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting 300 pound load without damage or permanent distortion.
- F. In areas where concrete will be exposed to weather or moisture (exterior areas of refuge and loading dock, etc.), all structural steel reinforcement and embedded items shall be epoxy coated in accordance with ASTM A775/A775M.

2.5 MISCELLANEOUS MATERIALS

- A. Grout: shall be ready-to-use metallic aggregate product requiring only addition of water at job site such as "Embeco Pre-mixed Grout" by Master Builder's; "Vibro-Foil Ready-Mixed" by W.R. Grace & Co.; or "Ferrolith G" by Sonneborn Building Products, Inc. Grout shall be easily workable and shall have no drying shrinkage at any age. Compressive strength of grout (2" x 2" cubes) shall not be less than 5000 psi at 7 days, and 7500 psi at 28 days.
- B. Vapor Barrier: shall be 15 mil polyethylene, unless specifically specified elsewhere.
- C. Curing Materials:
 - 1. Absorptive Cover: AASHTO M182, Class 2, 9-ounce burlap cloth.
 - 2. Moisture Retaining Cover: ASTM C171, Waterproof Paper, Polyethylene Film, or Polyethylene Coated Burlap.
 - 3. Liquid Membrane Curing Compound: ASTM C309, Type I, A. with a VOC content of 350 g/L or less. Product used shall be shown to be compatible with the later application of coatings. Curing compound shall not be used on any floor slab scheduled to receive an adhered floor finish.
- D. Anchor Rods: ASTM F1554, and ASTM A449. See structural drawings for types and locations.
- E. Cementitious Capillary waterproofing: shall be factory formulated in a design mix to be applied in slurry paste mixed to proper consistency with addition of water in quantities recommended by the manufacturer. Pre-mixed factory formulation shall be guaranteed not to contain additives such as chlorides, sulphates, iron oxides or similar deleterious substances. The waterproofing compound shall be composed of specially prepared Portland Cement, fine oven-dried Quartz aggregates and moisture active, chemically treated ingredients as manufactured by Penetron International Ltd. or other approved manufacturer.
- F. Bentonite Membrane Waterstop: shall be applied in conjunction with capillary waterproofing. The product shall be a 1/16 to 3/32 inch thick laminate of pure, paragrannular sodium-bentonite, firmly adhered to each side of nominal 15 to 20 mil thick non-biodegradable, high-density-polyethylene film. The product shall be capable of swelling to occupy a minimum volume of 17 milliliters when 2 grams are dispersed into deionized water.

- G. Chemical Hardener: All exposed concrete floor slabs shall be hardened with three applications of fluosilicate chemical hardener followed by two applications of clear acrylic concrete sealer by Sonneborn Division, ChemRex Inc. "Lapidolith"; or equal product by W.R. Meadows Co. or Concrete Service Material Company. Chemical Hardener shall be colorless, aqueous mixture of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent.
- H. Epoxy Bonding Agent: ASTM C881, to suit use.
- I. Joint Filler: Premolded, Compatible with finishes and sealers.

PART 3 -EXECUTION

3.1 INSPECTION

- A. Examine all work prepared by others to receive work of this Section and report any defects affecting installation to the Contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.
 - 1. Inspection shall be performed by a structural engineer licensed in the Commonwealth of Massachusetts. Certify compliance with shop drawings.

3.2 HANDLING, STORAGE, AND PROTECTION OF MATERIALS

- A. Handle and store materials separately in such manner as to prevent intrusion of foreign matter, segregation, or deterioration. Do not use foreign materials or those containing ice. Remove improper and rejected materials immediately from point of use. Cover materials, including steel reinforcement and accessories, during construction period. Stockpile concrete constituents properly to assure uniformity throughout project.

3.3 ERECTION OF FORMWORK, SHORING AND RESHORING

- A. Set and maintain formwork to insure complete concrete work within tolerance limits listed in ACI 347 latest edition, "Recommended Practice for Concrete Formwork", and with following additional requirements:
 - 1. Maximum variations from plumb:
 - a. In surfaces of walls:
 - a. In any 10 feet of length: 1/4 inch
 - b. Maximum for entire length: 1/2 inch
 - 2. Maximum variations from established position in plan shown on the drawings:
 - a. Walls: 3/4 inch
 - 3. Variations in cross-sectional dimensions of columns and beams and in thickness of slabs and walls.
 - a. Minus: 1/8 inch
 - b. Plus: 1/4 inch
- B. For a minimum of one hour prior to concrete placement, wet forms continuously with water to swell forms in order to prevent leakage of concrete matrix and to minimize absorption of concrete matrix water by form materials. This requirement may be waived for those specific cases where Designer deems it unnecessary or impractical. Care must be exercised to prevent a build-up of water at base of forms.
- 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 approval by Designer.

3.4 PLACING OF REINFORCEMENT

- A. Reinforcement shall be placed in accordance with requirements of CRSI 93, "Recommended Practice for Placing Reinforcing Bars" and CRSI 93, "Recommended Practice for Placing Bar Supports" and with further requirements below.
- B. Reinforcement shall be accurately placed in accordance with Contract Documents and shall be firmly secured in position by wire ties, chairs, spacers, and hangers, each of type approved by Designer.
- C. Bending, welding or cutting reinforcement in field in any manner other than as shown on Drawings, is prohibited, unless specific approval for each case is given by Designer.
- D. Reinforcement shall be continuous through construction joints unless otherwise indicated on Drawings.
- E. Reinforcement shall be spliced only in accordance with requirements of Contract Documents or as otherwise specifically approved by Designer. Splices of reinforcement at points of maximum stress shall generally be avoided. Welded wire fabric shall lap six inches or one space plus two inches whichever is larger, and shall be wired together.
- F. At time concrete is placed, reinforcement shall be free of excessive rust, scale, or other coatings that will destroy or reduce bond requirements. Reinforcement expected to be exposed to weather for a considerable length of time shall be painted with a heavy coat of cement grout. Protect stored materials so as not to end or distort bars in any way. Bars that become damaged will be rejected.
- G. Before concrete is cast, check all reinforcement after it is placed to insure that reinforcement conforms to Contract Documents and approved Shop Drawings. Such checking shall be done only by qualified experienced personnel. In addition, the Designer shall be notified at least 36 hours prior to concrete placement and given opportunity to inspect completed reinforcement and formwork before concrete placement. Prior approval of Shop Drawings shall in no way limit Designer's right to demand modifications or additions to reinforcement or accessories.

3.5 JOINTS

- A. Construction and control joints indicated on Drawings are mandatory and shall not be omitted.
- B. Joints not indicated or specified shall be placed to least impair strength of structure and shall be subject to approval of Designer.

3.6 INSTALLATION OF EMBEDDED ITEMS

- A. Conform to requirements of ACI 318, paragraph 6.3, "Conduits and Pipes Embedded in Concrete", and as specified below.
- B. Install steel sleeves, embedded wall plates and similar items, furnished by other trades, at locations shown on the drawings.

3.7 MIXING, CONSISTENCY, AND DELIVERY OF CONCRETE

- A. Retempering of concrete which has partially hardened, that is, mixing with or without additional cement, aggregates, or water, will not be permitted.

3.8 PLACING CONCRETE

- A. Intent of this Specification is that concrete shall not be pumped. Refer to "Submittals and Concrete Constituents" in this Section for requirements should pumping be proposed.
- B. Remove water and foreign matter from forms and excavations and, except in freezing weather or as otherwise directed, thoroughly wet wood forms just prior to placing concrete. Place no concrete on frozen soil and provide adequate protection against frost action during freezing weather.
- 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 brushes, and recleaned by stream of water or compressed air. Well before new concrete is deposited, joints shall be saturated with water. After free or glistening water disappears joints shall be given thorough coating of neat cement slurry mixed to consistency of very heavy paste. Surface shall receive coating of approximately one-eighth inch thick; this shall be scrubbed in by means of stiff bristle brushes. New concrete shall be deposited before neat cement dries or changes color.
- D. Do not place concrete having 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 avoid rehandling. Deposit no partially hardened concrete. Concrete shall not be allowed to flow horizontally over distances exceeding five feet.
- F. During and immediately after depositing, concrete shall be thoroughly compacted by means of internal type mechanical vibrators or other tools, or by spading to produce required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on only enough to produce homogeneity and optimum consolidation without permitting segregation of constituents or "pumping" of air. Vibrators used for normalweight concrete shall operate at speed at not less than 7,000 vpm and be of suitable capacity. Do not use vibrators to move concrete. Vibration shall be supplemented by proper wooden spade puddling to remove included bubbles and honeycomb adjacent to visible surfaces. At least one vibrator shall be on hand for every 10 cubic yards of concrete placed per hour, plus one spare. Vibrators shall be operable and on site prior to starting placement.
- G. Vertical lifts shall not exceed 18 inches. Vibrate completely through successive lifts to avoid pour lines. Vibrate first lift thoroughly until top of lift glistens to avoid stone pockets, 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. If section cannot be placed continuously between planned construction joints, as specified, field joint and additional reinforcement shall be introduced so as to preserve structural continuity. Designer shall be notified in any such case.
- I. Cold joints, particularly in exposed concrete, including "honeycomb", are unacceptable. If they occur in concrete surfaces exposed to view, Designer will require that entire section in which blemish occurs be removed and replaced with new materials at Contractor's expense.
- J. When placing exposed concrete walls or columns, strike corners of forms rapidly and repeatedly from outside along full height while depositing concrete and vibrating.

3.9 FINISHING OF UNFORMED CONCRETE SURFACES

- A. Smooth troweled finish: shall be provided where concrete flatwork is to be exposed in the finished work.

- B. Floated finish: shall be provided where concrete flatwork is to receive waterproofing membranes or setting beds for finished materials.
- C. Floated finish: shall be provided for top surfaces of walls, slabs and beams.
- D. Rough struck surface shall be provided at top of pedestals.
- E. Steel Broom Finish shall be provided at slabs to receive vapor mitigation.
- F. Refer to Landscape Drawings for finishes of exterior concrete walks, pavements, and stairs.
- G. Contractor, at his own expense, shall level depressed spots and grind high spots in concrete surfaces which are in excess of specified tolerances. Leveling materials proposed for providing proper surface shall be approved by Designer.

3.10 REPAIRING OF UNFORMED CONCRETE SURFACES

- A. Tops of slabs and walls shall be repaired by using either same material as originally cast or by use of dry-pack material, as approved by Designer. Areas affected shall be chipped back square and to depth of one inch minimum. Hole shall then be moistened with water for a minimum of two hours, followed by brush coat of 1/16 inch thick cement paste. Immediately plug hole with concrete, or with dry pack material consisting of 1:1.5 mixture of cement and concrete sand mixed slightly damp to touch. Hammer dry-pack into hole until dense, and excess paste appears on surface. Finish patch flush and to same texture as surrounding concrete. For large repairs employ 1-1-2 mixture of cement, concrete sand and pea gravel at same dry-pack consistency.

3.11 CURING AND PROTECTION

- A. When concrete is placed at or below ambient air temperatures of 40 degrees F. or whenever in opinion of Designer, such or lower temperatures are likely to occur within 48 hours after placement of concrete, cold weather concreting procedures, according to ACI 306 and as specified herein, shall be followed. To this end, entire area affected shall be protected by adequate housing or covering, and heating. No salt, chemicals or other foreign materials shall be used in the 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 and protected immediately after concreting or cement finishing is completed, to provide continuous moist curing above 50 degrees F. for at least seven days, regardless of ambient air temperatures.
- D. Keep permanent temperature record showing date and outside temperature for concreting operations. Thermometer readings shall be taken at start of work in morning, at noon, and again late in afternoon. Locations of concrete placed during such periods shall likewise be recorded, in such manner as to show any effect temperatures may have had on construction. Copies of temperature record shall be distributed daily to Designer.

3.12 REMOVAL OF FORMWORK, SHORING AND RESHORING

- A. Contractor shall be responsible for proper removal of formwork, shoring, and reshoring.
- B. Forms shall be removed only after concrete has attained sufficient strength to support its shown weight, construction loads to be placed thereon and lateral loads, without damage to structure or excessive deflection.

- C. Forms and supports shall remain in place for not less than minimum periods of time noted below. These periods represent cumulative number of days or fractions thereof, consecutive unless otherwise approved by Designer during which time mean daily air temperature at surfaces of concrete is above 50 degrees F.
 - 1. Vertical Surfaces: concrete shall have reached 100 day-degrees# and shall have attained strength of not less than 30 percent of f'c. Where such forms also support formwork for slab or beam soffits, removal times for latter shall govern.
 - 2. Horizontal Surfaces: except as noted below, concrete shall have reached 300 day-degrees of curing and attained strength of not less than 60 percent of f'c.
 - a. Soffits of beams or girders shall remain supported and in place until concrete has attained 600 day-degrees#.
 - b. Forms and supports of floor slabs shall remain in place until concrete has reached 400 day-degrees.
 - c. Definition of day-degrees: Total number of days times mean daily air temperature at surfaces of concrete. For example, five days at temperature of 60 degrees F. equals 300 day degrees. Days or fractions of days in which temperature is below 50 degrees F. shall not be included in calculation of day-degrees.
- D. Form removal shall be so performed that reshores are placed at same time as stripping operations, and that no area larger than one-fourth of a slab panel is unsupported at any time.
- E. Any test cylinders required to verify the specified minimum strengths for form removal shall be field cured under the same conditions as the concrete they represent. Such cylinders and testing shall be at the Contractor's expense.

3.13 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by THE OWNER for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.
- B. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
- C. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

3.14 CLEANING

- A. Concrete surfaces shall be cleaned of objectionable stains as determined by the Designer. Materials containing acid in any form or methods which will damage "skin" of concrete surfaces shall not be employed, except where otherwise specified.

END OF SECTION

SECTION 03400

STRUCTURAL PRECAST CONCRETE

PART 1 GENERAL

1.0 GENERAL REQUIREMENTS

- A. The General Conditions, Supplementary General Conditions, and Special Conditions of this Contract, along with Division 1 - General Requirements, as listed in the Table of Contents, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements 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.

1.1 SCOPE OF WORK

- A. All materials, and labor required for the design, transportation, furnishing, and erection of precast reinforced concrete work including, but not limited to, the following:
 - 1. Furnishing and installation of precast (Tunnel roof replacement)
 - 2. Furnishing and installation of miscellaneous anchors, bearing and all other connections, grouting of key-joints between adjacent precast work, accessories, and temporary shoring (if required).
 - 3. Providing openings required by work under other Sections. Install embedded channels, anchors, conduits, etc as necessary to facilitate mechanical, electrical, plumbing, and fire protection installation.
 - 4. Furnishing of precast work items, required to be built into or form part of work specified under other Sections, to appropriate trade, at proper time, with complete instructions to facilitate installation.
 - 5. Unless specifically excluded, furnishing and installation of any other items of precast concrete work indicated on Drawings, specified, or obviously needed to make work of this Section complete.
 - 6. Provide structural design by Commonwealth of Massachusetts registered professional engineer for all precast members including connections.
- B. Related work specified elsewhere:
 - 1. Section 033000 - Cast-in-place Concrete
 - 2. Section 051200 - Structural Steel
 - 3. Section 079010 – Joint Sealants

1.2 STANDARDS

- A. Except as otherwise specified herein, perform work in accordance with specifications noted below, including latest editions of applicable specifications, codes, and standards cited therein, and latest applicable addenda and supplements. Copies of these items shall be kept available in shop and field.
1. "The Commonwealth of Massachusetts State Building Code", latest edition.
 2. "Building Code Requirements for Structural Concrete" ACI 318-14, American Concrete Institute.
 3. ACI 347: "Recommended Practice for Concrete Formwork."
 4. PCI MNL-116: "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products."
 5. PCI Design Handbook, Precast and Prestressed Concrete, latest edition
 6. AISC Manual of Steel Construction, latest edition.
 7. AWS D1.1 : "Structural Welding Code."
 8. Fire Resistance: In accordance with PCI MNL 124.

1.3 SUBMITTALS

- A. Submit complete shop drawings in accordance with the requirements of Section 01300.
- B. Shop Drawings shall include information necessary for complete fabrication and installation of the component parts of the structure specified herein, which, without limiting generality thereof, and shall include the items noted below.
1. Erection and setting plans and details showing: identification mark; dimensions; finish; location of precast work, connections, openings, and headers; anchorage and grouting details; and precast concrete accessories.
 2. Details of all loose, cast-in and field hardware.
 3. Setting plans and details for work to be cast into other work.
 4. A physical and operational description of delivery, storage, erection and handling sequences.
 5. Design calculations including all dead, live and other applicable loads used in the design. Calculations shall state the basis for design and design assumptions. Calculations shall be indexed and shall be made and sealed by a professional engineer registered in the state of Massachusetts. Submit for review and approval prior to submission of shop drawings.
 6. Openings: Contractor shall coordinate opening requirements of other Sections and incorporate such openings on Shop Drawings prior to their submittal for approval.
 7. Production Drawings:
 - a. Elevation view of each member.

- b. Sections and details to indicate quantities and position of reinforcing steel, anchors, inserts, etc.
 - c. Lifting and erection devices.
 - d. Dimensions and finishes.
 - e. Prestress loads for strands and bars and concrete strengths at release and other critical times.
 - f. Estimated cambers at release, erection and at ten years of age.
 - g. Methods for storage and transportation.
 - h. Prepare complete design calculations and description of lifting method and erection procedure, coordinated with Shop Drawings, for precast work. And submit to Engineer for review prior to submission of shop drawings Calculations shall be stamped by an engineer licensed in the state of Massachusetts.
 - i. Except as otherwise noted, approval of Shop Drawings will be for size and arrangement of components. Errors in dimensions shown on Shop Drawings shall be responsibility of Contractor. Check and coordinate precast concrete work with work of other trades before submitting Shop Drawings.
 - j. Do not proceed with fabrication of material or performance of work until corresponding item on Shop Drawing has been approved by Structural Engineer of Record (SER).
- C. Joint Welding Procedures: Submit to SER, in accordance with requirements of Section 01300, joint welding procedures and program of welding sequence (for each component and for welding components together) before any welding is done. After return of submittal, welding procedures and sequences shall be followed without deviation. SER may require requalification of these welding procedures by tests prescribed in AWS "Standard Qualification Procedure".
- D. Joint Welding Testing: Submit to SER, in accordance with requirements of Section 01300, prior to start of fabrication, non-destructive testing method to be used for quality control of specific typical joints. Results of such tests during the course of work shall, upon request by Engineer, be made available for review by SER and/or Testing Agency.
- E. Welder Qualifications: Welding shall be done only by certified welding operators qualified according to AWS D.1.1. Submit welders' certificates attesting thereto.
- F. Test Reports: The manufacturer shall make available to the SER, upon request, records of concrete cylinder breaks for concrete used in the precast concrete products and mill tests of mild steel reinforcing and prestressing steel used.
- G. Three samples of exposed concrete finishes for selection of one for color and texture. The sample chosen shall serve as the quality control standard for the actual precast finishes which it represents.

1.4 DESIGN CRITERIA

- A. Standards

1. Unless shown otherwise, design all precast concrete work and connections in accordance with ACI 318 and AISC Manual of Steel Construction as appropriate.
 2. Precast elements may include members and cross sections that are not detailed on the documents. Contractor is responsible to provide all precast units whether explicitly shown or implied.
- B. Building Code: Conform to applicable requirements of the Massachusetts State Building Code with latest revisions.
- C. Design Loads and Requirements: Design loads shall be based on the applicable code requiring the greatest design loadings. In all case the combination of loads which provides the greatest stresses shall be used.
1. Members shall withstand their own weight; design loads due to pressure and suction of wind; live and dead loads including snow drift and storage piled snow around the perimeter; seismic forces, and handling, hauling and erection forces as applicable.
 2. Provide adjustment to accommodate misalignment of structure without permanent distortion, damage to components, wracking of joint connection, breakage of seals, and moisture penetration.
 3. Live load plus creep deflection shall not exceed $1/360 \times$ span length of member.
 4. Withstand all other superimposed loads, as indicated on the drawings, all within the deflection limitations governed by the design of the supporting structure.
 5. Allow for expansion and/or contraction, without harmful effect to the units, connections, joint seals, or adjoining construction due to a temperature range of 50 degrees F and shrinkage stresses.
- D. Camber of precast units: Anticipated camber and differential camber between units are to be shown on shop drawings and approved by the Structural Engineer. Design of hollow planks shall account for forces introduced by jacking and welding to reduce differential camber of adjacent planks. In any case, correction to differential camber shall be limited to cases where differential camber does not exceed $\frac{1}{2}$ inch. Field cast washes shall be used to correct differential camber between adjacent units, as required. (After correction of camber, the resulting differential between adjacent units shall not exceed $\frac{1}{8}$ inch.)
- E. Connections: In addition to connection requirements for gravity and seismic, design all connections for the effect of shrinkage forces, temperature changes, and deflections of the supporting or adjacent structures. Connections shown on the Contract Drawings do not relieve the manufacturer of the responsibility for the design and performance of connections. This Contractor shall supply locations, sizes and lengths of all required plates, inserts, steel angles, anchors, etc. to the concrete cast-in-place Contractor for installation in the supporting concrete work. All connections used for this project should be concealed (not visual to view) wherever possible. Plates, shapes and bars shall be stainless steel to inhibit rusting and staining.
- F. Reinforcing: Conform to requirements of ACI 318. Reinforce all bearing areas against diagonal tension, splitting, rupture and flexure. Place extra ties, stirrups and reinforcing bars at support points. Allow no bearing pressure in edges of unreinforced sections.
- G. Design Deviations: precast work shall not vary in shape from the shapes shown on the drawings and strengths of elements shall not be less than that shown on the contract drawings

1. Design deviations will be permitted only after the Engineer's written approval of the manufacturer's proposed design supported by complete design calculations and drawings.
 2. Design deviations shall provide an installation equivalent to the basic intent without incurring additional cost to the owner.
- H. Fire Ratings: Provide sufficient concrete cover to comply with the following fire ratings (PCI MNL 124):
1. Provide two hours on all floor units, and three hours on all wall, girders, and beams.

1.5 FABRICATOR AND ERECTOR QUALIFICATIONS

- A. Manufacturer qualifications: The precast concrete manufacturing plant shall be certified by the Precast/Prestressed Concrete Institute, Plant Certification Program, prior to the start of production.
- B. Erector qualifications: Regularly engaged for at least 8 years in the erection of precast structural concrete similar to the requirements of the project.

1.6 INSPECTION, TESTING, AND QUALITY CONTROL

- A. In general compliance with testing provisions in MNL-116, Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
- B. Inspection and testing of precast concrete work will be performed by the Structural Engineer of Record (SER) and an independent Testing Agency under separate contract with the Owner. Materials and workmanship shall be subject to inspection and testing in plant and field by SER and/or Testing Agency. Such inspection and testing shall not relieve Contractor of his responsibility to provide his own inspection, testing, and quality control and to furnish materials and workmanship in accordance with requirements of Contract Documents. Quality control Inspection shall conform to AWS D1.1, Chapter 6.
- C. Non-destructive Weld Testing: Magnetic particle, radiographic, or ultrasonic testing. Test 100% of partial or full penetration welds. Test a minimum of one spot per ten connections but not less than one spot per 25 linear feet of all welds by each welder.
- D. Facilitate inspection and testing by SER and/or Testing Agency. Contractor shall, at his own expense, furnish SER and/or Testing Agency upon request with:
 1. Complete sets of approved Shop Drawings and corrective work procedures in plant and field.
 2. Representative sample pieces requested for testing.
 3. Full and ample means and assistance for testing materials, and proper facilities for inspection of work, in plant and field.
- E. Precast work not conforming to fabrication tolerances or having defects, as determined by the SER, which may adversely affect strength or performance of precast work will be rejected. Rejected precast work may be load-tested, if requested by the Contractor and approved by the Engineer, to ascertain if defects affect strength and/or performance of precast work in the opinion of the SER. Cost of such testing shall be borne by Contractor.

- F. Any material or workmanship rejected by the SER and/or Testing Agency in plant or field shall be replaced promptly by Contractor to satisfaction of SER and/or Testing Agency, and at no expense to the Owner.
- G. Acceptance of work in plant shall not prevent final rejection of work at job site, even after erection, if work is found to be defective in any way.

PART 2 PRODUCTS

2.1 PROPERTY OF UNITS

- A. Property of units: $f_c = 28$ day compressive strength. $w/c =$ water to cement ratio.

Release strength for prestressed concrete units shall be 3,500 psi minimum. Entrained air in the following mixes shall be 6% plus or minus 1%.

Solid planks: Precast, $f_c = 5,000$ psi, $w/c = 0.40$

2.2 CONCRETE CONSTITUENTS

- A. Concrete (28 day compressive strength – See above).
 - 1. Portland Cement: ASTM C150, type I or type III. Tan color. Color to be approved by Architect. One color and one source for cement shall be used in all precast and cast-in-place concrete visible in the finished structure
 - 2. Aggregate: ASTM C33.
 - 3. Water: potable, clean and free from injurious amounts of deleterious substances. (See above for w/c ratios)
 - 4. Admixtures:
 - a. Air-entraining admixtures: ASTM C260.
 - b. Water reducing, retarding, accelerating, high range water reducing admixtures: ASTM C494.
 - c. Corrosion Inhibitor Admixture: ASTM G109 & ASTM G61, corrosion inhibiting rate not less than 9.9 pounds of chloride per cubic yard. Solution of Calcium Nitrite, 30% +/- 2% by weight.
 - d. Calcium chloride or admixtures containing chlorides shall not be used.
- B. Non-shrink Cement Grout: shall be ready to use metallic aggregate product requiring only addition of water at job site such as "Embeco Pre-mixed Grout" by Master Builders; "Vibro-Foil Ready-Mixed" by W.R. Grace & Co.; "Ferrolith G" by Sonneborn Building Products, Inc.; or equal. Grout shall be easily workable and shall have no drying shrinkage or settlement at any age. Compressive strength of grout (2" x 2" cubes) shall not be less than 5000 psi at 7 days, and 7500 psi at 28 days.
- C. Dams for concrete or grout: standard used by precast concrete manufacturer, as approved by SER.

2.3 FORMWORK MATERIALS

- A. Forms: Rigid, properly reinforced to provide a product of precast units meeting tolerances and quality indicated, made of steel.
- B. Form Coating or Release Agent: Chemical type similar to L & M Debond Form Coating.

2.4 REINFORCEMENT MATERIALS

- A. Reinforcing Steel and Accessories
 - 1. Reinforcing Bars: ASTM 615, Grade 60.
 - a. For Fabrication tolerances conform to ACI 301, Chapter 5, Paragraph 5.4.
 - b. All reinforcing bars having assigned positions shall have distinguishing marks plainly indicated thereon, which marks shall agree with those given on the shop drawings relating to or calling for bars.
 - c. Reinforcing bar shall be provided to resist all tensile stresses incurred during initial prestressing, handling and erection.
 - 2. Strand: Uncoated, 7 - wire strand: ASTM A416 - Grade 250 or 270.
 - 3. Welded Wire Steel Fabric: ASTM A-185, cold drawn wire; galvanized. Supply in flat-tened sheets.
 - 4. Tie wires within 2" of surface exposed to weather shall be #16 monel metal or stainless steel.
 - 5. Reinforcing Bar Accessories: Type to suit the condition; non-corrosive.

2.5 MISCELLANEOUS MATERIALS

- A. Connection Materials for Precast Construction
 - 1. Steel shapes plate and bars, U.N.O: ASTM A36.
 - 2. Connection plates and shapes: Stainless steel conforming to ASTM A666, Type 304, Grade A36. Only stainless steel welds shall be used.
 - 3. Other steel plates: Structural quality, hot-rolled carbon steel, conforming to ASTM A283, Grade C.
 - 4. Stainless Steel: ASTM A666, Type 304.
 - 5. Anchor bolts: Bolts, regular hexagon nuts, and carbon steel washers shall conform to ASTM A-449.
 - 6. Finish of steel, other than stainless: All steel components shall be hot-dipped galvanized. Touch-up paint for use after erection and after welding of connections shall be two coats of zinc rich epoxy paint or approved equal, and painted as specified in Section 9.
 - 7. Threaded Rods: Shall be coil rods made of high tensile grade steel, hot dip galvanized. The rated ultimate capacity for $\frac{3}{4}$ " rods to be 36,000 pounds, for 1" rods 75,000 pounds. Dayton Sure-Grip and Shore Co., or equal.

B. Bearing Pads for Precast Construction:

1. Neoprene: Use 70 Durometer material, except for pads on enclosure walls which shall be 50 Durometer. Pad size shall be shown in the Construction Documents and they shall conform to Division 11, Section 25, of AASHTO Standard Specifications for Highway Bridges.
2. Random-Fiber Reinforced Elastomeric: Use 80 Durometer material. Size shall be shown in the Construction Documents. Pads shall support a compressive stress of 3,000 psi with no crackling, splitting, or delaminating in the internal portions of the pad. One specimen shall be tested for each 200 pads used in the project.
3. Low Friction Bearings: Tetrafluoroethylene (TFE), Reinforced with glass fibers and applied to stainless or structural steel plates. Static friction coefficient shall not exceed .08 at 1000 psi bearing pressure.

C. Shims

1. Hot-dipped galvanized steel (2 oz. coating) or plastic, "Korolath" or equal.
2. Stainless steel with Teflon coating one side for precast work as shown on Drawings.

D. Joint Fillers: Non-staining, compressible and resilient, closed cell joint filler of neoprene foam, polyethylene foam, polyurethane foam, polyvinyl chloride foam, or flexible vinyl tubing. Joint fillers which contain or have been treated with oil, grease, or bituminous materials are prohibited. Test joint fillers for compatibility with proposed primers and sealants.

E. Joint Sealant: Apply joint sealant in all construction joints, control joints and floor drain perimeters in the floor surface. Acceptable materials are:

1. "Isoflex 880GB/881" by Harry S. Peterson Companies, Pontiac, Michigan.
2. "Urexpan NR-200/Dynatred" by Pecora Corporation, Harleysville, Pennsylvania.
3. "Sonolastic Paving Joint Sealant" by Sonneborn Contech, Minneapolis, Minnesota.
4. "THC900/THC901" by Tremco, Cleveland, Ohio.

F. Grout Materials:

1. Non-Metallic Shrinkage- Resistant Grout:

- a. Premixed, non- metallic, non- corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing, and water reducing agents, complying with CRD- C621.
- b. Product: Euclid Chemical Co. Model Euco N.S., L&M Construction Chemicals, model Crystex, Master Builder Model Masterflow 713, U.S. Grout Corp. Model Five Star Grout, Upco Chemical Division USM Corp Model Upcon, Protex Industries Inc. Model Propak, Set Products Inc. Model Set Non-Shrink.

G. Epoxy Grout: Two component mineral filled epoxy resin, ASTM-881 or FS-MMM- A-001993.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine all work to receive work of this Section and report any defects affecting installation to the Contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.

3.2 DESIGN

- A. Design precast reinforced concrete elements not specifically detailed on Contract Documents. These elements shall be designed in accordance with ACI 318-95 to safely sustain a superimposed load as indicated on Contract Documents.
- B. Prepare and submit complete design calculations of the precast work as outlined under "Submittals" in this Section.

3.3 FABRICATION

- A. Manufacturing procedures shall be in general compliance with PCI MNL-116.
- B. Manufacturing tolerances shall comply with PCI MNL-116.
- C. Fabricate Precast work as detailed on Contract Documents and/or to satisfy requirements noted under "Design" in this Section.
- D. Cure precast work to assure that design requirements are satisfied.
- E. Cut precast work to length with tolerance of plus or minus 1/4 inch.
- F. Precast work shall be free of honeycomb, voids, or chips.
- G. Provide removable identification marks on precast work, properly correlated with Shop Drawings, to denote orientation, dimensions, and reinforcement.
- H. Provide openings in precast concrete work as shown on Drawings and as required by building trades.
- I. Built in Anchorages:
 - 1. Accurately position built in anchorage devices and secure to formwork.
 - 2. Locate anchorages where they do not affect position of main reinforcement or the placement of concrete.

3.4 FINISHES

- A. Standard underside: Resulting from casting against approved forms using good industry practice in cleaning of forms, design of concrete mix, placing and curing. Small surface holes caused by air bubbles, normal color variations, normal form joint marks, and minor chips and spalls shall be tolerated, but no major or unsightly imperfections, honeycomb, or other defects shall be permitted.
- B. Standard top: Result of vibrating screed and additional hand finishing at projections. Normal color variations, minor indentations, minor chips and spalls shall be permitted. No major imperfections, honeycomb, or defects shall be permitted.

- C. Vertical ends: When exposed to view, strands shall be recessed a minimum of $\frac{3}{4}$ in., the holes filled with grout and the ends of the member shall receive sacked finish.

3.5 HANDLING AND STORAGE

A. Delivery and handling:

1. Precast concrete members shall be lifted and supported during manufacturing, stockpiling, transporting and erection of operations only at the lifting or supporting points, as shown on the shop drawings, and with approved lifting devices. Lifting inserts shall have a minimum safety factor of 4. Reusable lifting hardware and rigging shall have a minimum safety factor of 5.
2. Transportation, site handling, and erection shall be performed with acceptable equipment and methods, and by qualified personnel.

B. Storage:

1. Store all units off ground.
2. Place stored units so that identification marks are discernible.
3. Separate stacked members by battens across full width of each bearing point.
4. Stack so that lifting devices are accessible and undamaged.
5. Do not use upper member of stacked tier as storage area for shorter member or heavy equipment.
6. Identification:
 - a. Provide permanent markings to identify pick points and orientation in structure, complying with markings on final shop drawings.
 - b. Imprint date of casting on each recast unit on a surface which will not show in the finished structure.

3.6 ERECTION

- A. Installation of precast, prestressed concrete shall be performed by the manufacturer or a competent erector. Members shall be lifted by means of suitable lifting devices at points provided by the manufacturer. Temporary shoring and bracing, if necessary, shall comply with manufacturer's recommendation.
- B. Erect precast concrete element work in accordance with approved Shop Drawings and as specified herein.
- D. Preparation:
- General contractor shall be responsible for:
1. Providing true, level bearing surfaces on all field placed bearing walls and other field placed members.

2. Placement and accurate alignment of anchor bolts, plates or dowels in column footings, grade beams and other field placed supporting members.
 3. Prior to erection of precast work, provide certified survey of elevation of surfaces to receive the work.
- E. Precast work shall be shipped to job site at proper length. Do not field cut.
 - F. Equipment and methods proposed for lifting precast work shall be approved in writing by precast concrete manufacturer, and shall be submitted for record to the Engineer.
 - G. Transversely warped or bowed precast work shall not be used.
 - H. Do not erect any precast work until all supports have been fully aligned and completed. If supports are not in proper alignment, or at proper level, no precast work shall be erected until necessary corrections have been made.
 - I. Precast work shall be placed on supports and accurately aligned to final position to provide tight key-joints and minimum bearing as shown on the Drawings.
 - J. After precast work have been properly aligned, level precast work so as to eliminate differential camber and other similar irregularities. Level precast work at uneven bearing surfaces by use of steel shims. Variations between adjacent members shall be reasonably leveled out by jacking, loading, or any other feasible method as recommended by the manufacturer and acceptable to the SER.
 - K. Construction loads exceeding design capacity of precast work shall not be placed on precast work at any time without installation of appropriate and adequate temporary shoring.
 - L. After precast work have been properly leveled, grout key-joints thoroughly and fill with approved non-shrink cement grout fill. Grout consistency shall be such as to completely fill key-joints without seeping through joints below. Grout only during ambient temperatures of 40 degrees F. and maintain installed grout above 50 degrees F. for first five (5) days, and provide moist curing.
 - M. Immediately after erection, or as required subsequent thereto, precast work with minor defects may be patched subject to Engineer's approval of method and results.

3.7 ATTACHMENTS

- A. Subject to approval of the Engineer, precast, prestressed concrete products may be drilled or "shot" provided no contact is made with the prestressing steel. Should spalling occur, it shall be repaired by the trade doing the drilling or the shooting.

3.8 INSPECTION AND ACCEPTANCE

- A. Final inspection and acceptance of erected precast, prestressed concrete shall be made by the Structural Engineer within a reasonable time after the work is completed.

END OF SECTION

SECTION 040001

MASONRY WORK

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert name of sub-bidder)

MASS. STATE PROJECT: ((Insert project number from top of page))

SUB-BID FOR SECTION: 040001 – MASONRY WORK

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Awarding Authority.
3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Awarding Authority in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

A101 SIDEWALK PLANS – DEMO AND PROPOSED
A102 PARTIAL ROOF PLAN – NORTH
A103 PARTIAL ROOF PLAN – SOUTH
A110 ENLARGED ENTRY PLAN
A201 EXTERIOR ELEVATIONS
A202 EXTERIOR ELEVATIONS
A501 ROOF DETAILS
A502 ROOF DETAILS
A510 SIDEWALK SECTIONS - DEMO AND PROPOSED

- A511 SIDEWALK SECTIONS - DEMO AND PROPOSED
- A512 SIDEWALK SECTIONS
- A513 SIDEWALK SECTIONS, ELEVATIONS, AND DETAILS

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. All Work of Section 040120 –MASONRY RESTORATION AND CLEANING
 - 2. All Work of Section 042000 – UNIT MASONRY
- B. Alternates: Not Applicable.

END OF SECTION

SECTION 040120

MASONRY RESTORATION AND CLEANING

(Part of Work of Section 040001 - MASONRY WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Repairing clay and stone masonry, including replacing damaged units as indicated on Drawings.
2. Reanchoring veneers.
3. Repointing mortar joints, removing existing mortar and replacing with new color mortar.
4. Provide for repair or replacement of clay and stone masonry broken or damaged during disassembly and reconstruction. Contractor shall be responsible for damage resulting from work of this Section.
5. Provide shoring and bracing required to maintain stability of masonry during work of this Section. Coordinate with requirements of Section 011000 - GENERAL REQUIREMENTS.

- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 024100 - DEMOLITION for demolition, removal and salvage requirements, to the extent not specified in this Section.
2. Section 042000 - UNIT MASONRY for new clay masonry veneer.
3. Section 076200 - SHEET METAL FLASHING AND TRIM for metal flashing installed in or on restored masonry.
4. Section 079200 - JOINT SEALANTS for sealing joints in restored masonry.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

- B. Samples for Verification: Before erecting mockup, submit samples of the following:

1. Each type of exposed masonry unit to be used for replacing existing units.
 - a. For each brick type, provide straps or panels containing at least four bricks.
 - b. For each stone type, provide straps or panels containing at least four stones.
2. Each type of sand used for pointing mortar.
 - a. For blended sands, provide samples of each component and blend.

- b. Identify sources, both supplier and quarry, of each type of sand.
 3. Each type of pointing mortar in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
 - a. Include with each sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
 4. Each type of anchor, insert, dowel, and attachment, full size.
 5. Each type of masonry patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each sample with manufacturer and stock number or other information necessary to order additional material.
- C. Restoration Program: For each phase of restoration process, provide detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials on building and Project site.
 1. Include methods for keeping pointing mortar damp during curing period.
 2. If materials and methods other than those indicated are proposed for any phase of restoration work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.
- D. Cleaning Program: Describe cleaning process in detail, including materials, methods, and equipment to be used and protection of surrounding materials on building and Project site, and control of runoff during operations.
 1. If materials and methods other than those indicated are proposed for cleaning work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.

1.4 QUALITY ASSURANCE

- A. Chemical Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- B. Source Limitations: Obtain each type of material for masonry restoration (face brick, stone, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- C. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to test the following. Provide test specimens and assemblies as indicated.
 1. Replacement Brick: For each proposed type of replacement brick, according to sampling and testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).
 2. Existing Brick: For each type of existing brick indicated for replacement, according to testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction). Carefully remove existing bricks from locations designated by Architect.

- D. Mockups: Prepare mockups of restoration and cleaning as follows to demonstrate aesthetic effects and qualities of materials and execution. Prepare mockups on existing walls under same weather conditions to be expected during remainder of the Work.
 - 1. Repair an area approximately 36 inches high by 48 inches wide for each type of masonry material indicated to be rebuilt or replaced.
 - 2. Patch three small areas at least 1 inch in diameter for each type of masonry material indicated to be patched.
 - 3. Rake out joints in two separate areas approximately 36 inches high by 72 inches wide for each type of repointing required and repoint one of the two areas.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.
- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store lime putty covered with water in sealed containers.
- F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.6 PROJECT CONDITIONS

- A. Repoint mortar joints and repair masonry only when air temperature is between and 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of work.
- B. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing:
 - 1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
 - 2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.
- C. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 90 deg F and above.

- D. Patch masonry only when air and surface temperatures are between and 55 and 100 deg F and are predicted to remain above 55 deg F for at least 7 days after completion of work. On days when air temperature is predicted to go above 90 deg F, schedule patching work to coincide with time that surface being patched will be in shade or during cooler morning hours.
- E. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.7 SEQUENCING AND SCHEDULING

- A. Order replacement materials at earliest possible date, to avoid delaying completion of the Work.
- B. Order sand for repointing mortar immediately after approval of Samples or mockups. Take delivery of and store at Project site a sufficient quantity of sand to complete Project.
- C. Perform masonry restoration work in the following sequence:
 - 1. Remove plant growth.
 - 2. Repair existing masonry, including the following:
 - a. Reconstructing and resetting existing stone work.
 - b. Replacing existing masonry with new masonry materials.
 - 3. Rake out joints that are to be repointed.
 - 4. Point mortar joints.
 - 5. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 6. Clean masonry surfaces.
- D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with Part 3 "Masonry Unit Patching and Repairs" Article. Patch holes in mortar joints to comply with Part 3 "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

- A. Face Brick and Accessories: Provide face brick and accessories, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.
 - 1. Provide units with colors, surface texture, size, and shape to match existing brickwork and with physical properties not less than those determined from preconstruction testing of selected existing units.
 - a. For replacement brick at existing building provide brick to match existing as approved by Architect.
 - b. For existing brickwork that exhibits a range of colors, provide brick that matches that range rather than brick that matches an individual color within that range.
 - 2. Provide units with colors, surface texture, and physical properties to match Architect's sample. Match existing units in size and shape.
 - a. For sample that exhibits a range of colors, provide brick that matches that range rather than brick that matches an individual color within that range.
 - 3. Provide specially molded shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

4. Provide specially ground units, shaped to match patterns, for arches and where indicated.
- B. Building Brick: Provide building brick complying with ASTM C 62, of same vertical dimension as face brick, for masonry work concealed from view.
 1. Grade SW where in contact with earth.
 2. Grade SW, MW, or NW for concealed backup.
- C. Stone: Reuse existing salvaged stones, where available, and as follows:
 1. Varieties, Cut and Finish: To match existing stones, as approved by Architect.
 2. For existing stone that exhibits a range of colors, finishes, sizes, or shapes, provide stone that matches that range rather than stone that matches an individual color, finish, size, or shape within that range.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II.
 1. Provide white cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Sand: ASTM C 144, unless otherwise indicated.
 1. Color: Provide natural sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
 2. For pointing mortar, provide sand with rounded edges.
 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands, if necessary, to achieve suitable match.
- D. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.
 1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. SGS Mortar Colors: Solomon Grind-Chem Services, Inc.
 - b. True Tone Mortar Colors: Davis Colors, a Subsidiary of Rockwood Industries, Inc.
- E. Water: Potable, clean and free from injurious amount of oil, alkali, organic matter or other deleterious material.

2.3 CLEANING MATERIALS

- A. Water: Potable, clean and free from injurious amount of oil, alkali, organic matter or other deleterious material.
- B. Hot Water: Heat water to a temperature of 140 to 160 deg F.

- C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups of trisodium phosphate (TSP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

2.4 MISCELLANEOUS MATERIALS

- A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry, is vapor- and water permeable, exhibits low shrinkage, and develops high bond strength to all types of masonry.
1. Formulate patching compound used for patching brick in colors and textures to match brick being patched. Provide number of colors needed to enable matching each brick.
 2. Available Products:
 - a. Cathedral Stone Products, Inc.; Jahn Restoration Mortar.
 - b. Edison Coatings, Inc.; Custom System 45.
 - c. Bonstone Materials Corp., Stone Repair.
- B. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
1. Available Products:
 - a. American Building Restoration Products, Inc.; LM 130 Acid Shield.
 - b. Diedrich Technologies Inc.; Diedrich Acid Guard.
 - c. Price Research, Ltd.; Price Mask.
 - d. ProSoCo; Sure Klean Strippable Masking.
- C. Masonry Repair Anchors, Expansion Type: Mechanical fasteners designed for masonry veneer stabilization consisting of 1/4-inch- diameter, Type 316 stainless-steel rod with brass expanding shells at each end and water-shedding washer in the middle. Expanding shells shall be designed to provide positive mechanical anchorage to veneer on one end and backup masonry on the other.
1. Available Products:
 - a. BLOK-LOK, a Hohmann & Barnard Company; Torq-Lok.
 - b. Dur-O-Wal, a Hohmann & Barnard Company; Dur-O-Wal Repair Anchor.
 - c. Hohmann & Barnard, Inc.; #521RA-B Restoration Anchor.
- D. Masonry Repair Anchors, Spiral Type: Type 304 stainless-steel spiral rods designed to anchor to backing and veneer. Anchors are flexible in plane of veneer but rigid perpendicular to it.
1. Provide adhesive-installed anchors complete with manufacturer's standard epoxy adhesive and injection tubes, screens, sleeves, or other devices required for installation.
 2. Provide driven-in anchors designed to be installed in drilled holes and relying on screw effect rather than adhesive to secure them to backup and veneer.
 3. Available Products:
 - a. Dur-O-Wal, a Hohmann & Barnard Company; Dur-O-Flex.
 - b. Heckmann Building Products, Inc.; #391 Spiro Remedial Tie.
 - c. Helifix Ltd.; Helifix HRT60 or Helifix HRT80.
 - d. Hohmann & Barnard, Inc.; Helix Spiro-Ties.
- E. Stone Anchors: Type and size indicated or, if not indicated, to match existing anchors in size and type. Fabricate anchors and dowels from ASTM A 167, Type 304 stainless steel.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Halfen USA.
 - b. Heckmann Building Products.
 - c. Hohmann & Barnard, Inc.
 2. Adhesives, for Stone Anchors and Pins: ASTM C 881, Types I, II, IV & V, Grade 1, high modulus, high strength, moisture-insensitive, high-viscosity epoxy adhesive.
 - a. Basis of Design: Sika; Sikadur 31, Hi-Mod Gel, or approved equal by anchor manufacturer.
- F. Stone-to-Stone Adhesive: 2-part polyester or epoxy-resin stone adhesive with a 15- to 45-minute cure at 70 deg F or 1-part cementitious stone adhesive, recommended by adhesive manufacturer for type of stone repair indicated, and matching stone color.
1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Two-Part Polyester or Epoxy:
 - 1) Akemi North America; Akepox.
 - 2) Bonstone Materials, Inc.; A-199-T/B-439-T.
 - 3) Edison Coatings, Inc.; Flexi-Weld 520T.
 - a) Aggregate for mixing with epoxy: Granite of the same color as the area to be patched, reduced to a fine aggregate with a mallet. Use particles that pass through a No. 50 sieve and are retained on a No. 200 sieve.
 - b. One-Part Cementitious Stone Adhesive:
 - 1) Cathedral Stone Products, Inc.; Jahn Restoration Adhesive.
- G. Joint Sealant and Backer Rods: Refer to Section 079200 - JOINT SEALANTS.
- ## 2.5 MORTAR MIXES
- A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.
- B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
- C. Colored Mortar: Produce mortar of color required by using selected ingredients. Do not alter specified proportions without Architect's approval.
1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.
 2. Color: Match existing, or as otherwise directed by Architect.

- D. Do not use admixtures of any kind in mortar, unless otherwise indicated.
- E. Mortar Proportions: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts sand.
 - a. Add mortar pigments to produce mortar colors required.
 - 2. Rebuilding (Setting) and Pointing Mortar, for Stone: Comply with ASTM C 270, Proportion Specification, Type N, unless otherwise indicated, with cementitious material limited to portland cement and lime.
 - a. Mix: 1 part portland cement, 2 parts lime, and 6-7 parts sand.
 - b. Add mortar pigments to produce mortar colors required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
 - 1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
- B. Prevent mortar from staining face of surrounding masonry and other surfaces.
 - 1. Cover sills, ledges, and projections to protect from mortar droppings.
 - 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 - 3. Immediately remove mortar in contact with exposed masonry and other surfaces.
 - 4. Clean mortar splatters from scaffolding at end of each day.

3.2 UNUSED ANCHOR OR EMBEDDED STEEL REMOVAL

- A. Remove embedded masonry anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.
 - 1. Remove items carefully to avoid spalling or cracking masonry.
 - 2. If item cannot be removed without damaging surrounding masonry, cut off item flush with surface and core drill surrounding masonry and item as close around item as practical.
 - 3. Patch holes where items were removed unless directed to remove and replace units.

3.3 MASONRY REMOVAL AND REPLACEMENT

- A. At locations indicated, remove masonry units that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
 - 1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
 - D. Remove in an undamaged condition as many whole bricks and stones as possible.
 - 1. Remove mortar, loose particles, and soil from brick and stone by cleaning with hand chisels, brushes, and water.
 - 2. Remove sealants by cutting close to brick and stone with utility knife and cleaning with solvents.
 - 3. Store brick and stone for reuse, as indicated.
 - 4. Deliver cleaned brick and stone not required for reuse to Owner, unless otherwise directed.
 - E. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
 - F. Install replacement masonry into bonding and coursing pattern of existing masonry, match existing mortar joints for size. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
 - G. Lay replacement masonry units with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Maintain joint width for replacement units to match existing joints.
 - 1. Bricks: Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
 - 2. Tool exposed mortar joints in repaired areas to match joints of surrounding existing masonry work.
 - 3. Rake out mortar used for laying brick and stone before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
- 3.4 REANCHORING VENEERS
- A. Install masonry repair anchors in horizontal mortar joints and according to manufacturer's written instructions. Install at not more than 16 inches o.c. vertically and 32 inches o.c. horizontally, unless otherwise indicated. Install at locations to avoid penetrating flashing.
 - B. Recess anchors at least 5/8 inch from surface of mortar joint and fill recess with pointing mortar.
- 3.5 MASONRY UNIT PATCHING AND REPAIRS
- A. Patch the following masonry units:
 - 1. Units indicated to be patched.
 - 2. Units with holes.
 - 3. Units with chipped edges or corners.
 - 4. Units with small areas of deep deterioration.
 - B. Remove and replace existing patches, unless otherwise indicated or approved by Architect.

C. Patching Bricks:

1. Remove loose material from brick surface. Remove additional material so patch will not have feathered edges and will be at least 1/4 inch thick, but not less than recommended by patching compound manufacturer.
2. Mask or remove surrounding mortar joints if patch will extend to edge of brick.
3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
4. Rinse surface to be patched and leave damp, but without standing water.
5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
6. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
7. Trowel, scrape, or carve surface of patch to match texture and surface plane of surrounding brick. Shape and finish surface before or after curing, as determined by testing, to best match existing brick.
8. Keep each layer damp for 72 hours or until patching compound has set.

D. Stone Repairs and Partial Stone Replacement (Dutchman Repair):

1. At locations indicated, remove rectangular portion of stone units. Carefully remove stone by making vertical and horizontal saw cuts at face of stone and demolishing corner portion of stone unit to depth required for fitting partial replacement (Dutchman). Make edges of stone at cuts smooth and square to each other and to finished surface. Make back of removal area flat and parallel to stone face.
2. Remove mortar from joints that abut area of stone removal to same depth as stone was removed. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiber brush.
3. Trim partial replacement (Dutchman) to accurately fit area where stone was removed.
4. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of existing stone and partial replacement, completely filling all crevices and voids.
 - a. Apply partial replacement or fit stone fragments onto building stone while adhesive is still tacky and hold fragment securely in place until adhesive has cured.
 - b. Use shims, clamps, wedges, or other devices as necessary to align face of partial replacement with face of stone unit being repaired.
5. After adhesive has fully cured, further anchor partial replacements where indicated with 1/4-inch- diameter, plain stainless-steel rods set into 1/4-inch- diameter holes drilled at a 45-degree downward angle through face of stone. Center and space anchor rods between 3 and 5 inches apart and at least 2 inches from any edge. Insert rods at least 2 inches into backing stone and 2 inches into partial replacements with end countersunk at least 3/4 inch from exposed face of stone.
6. Clean residual adhesive from exposed surfaces.

3.6 MASONRY CLEANING

- A. Cold-Water Wash: Use cold water applied by low-pressure spray.
- B. Cold Water Soak:
 1. Apply cold water by intermittent soaking.

2. Use perforated hoses or other means that will apply a fine water mist to entire surface being cleaned.
 3. Apply water in cycles with at least 30 minutes between cycles.
 4. Continue water application until surface encrustation has softened sufficiently to permit its removal by water wash, as indicated by cleaning tests.
 5. Remove soil and softened surface encrustation from masonry with cold water applied by low-pressure spray.
- C. Hot-Water Wash: Use hot water applied by low-pressure spray.
- D. Steam Cleaning: Apply steam at pressures not exceeding 80 psi.
- E. Detergent Cleaning:
1. Wet masonry with water applied by low-pressure spray.
 2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.
 3. Rinse with water applied by low-pressure spray to remove detergent solution and soil.
 4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

3.7 REPOINTING MASONRY

- A. Rake out and repoint mortar joints to the following extent:
1. All joints in areas indicated.
 2. Joints where mortar is missing or where they contain holes.
 3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
 4. Cracked joints where cracks are 1/8 inch or more in width and of any depth.
 5. Joints where they sound hollow when tapped by metal object.
 6. Joints where they are worn back 1/4 inch or more from surface.
 7. Joints where they are deteriorated to point that mortar can be easily removed by hand.
 8. Joints, other than those indicated as sealant-filled joints, where they have been filled with substances other than mortar.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows:
1. Remove mortar from joints to depth of 2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, unweathered mortar.
 2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 - a. Cut out mortar by hand with chisel and mallet. Do not use power-operated grinders without Architect's written approval based on submission by Contractor of a satisfactory quality-control program and demonstrated ability of operators to use tools without damaging masonry. Quality-control program shall include provisions for supervising performance and preventing damage due to worker fatigue.

- b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and mallet. Strictly adhere to written quality-control program. Quality-control program shall include provisions for demonstrating ability of operators to use tools without damaging masonry, supervising performance, and preventing damage due to worker fatigue.
- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Point joints as follows:
 - 1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen masonry-joint surfaces before pointing.
 - 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
 - 3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer.
 - a. Where existing bricks have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces.
 - b. Take care not to spread mortar over edges onto exposed masonry surfaces or to featheredge mortar.
 - 4. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.
- F. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.
 - 1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - 2. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
- G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.8 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Wash adjacent woodwork and other nonmasonry surfaces. Use detergent and soft brushes or cloths.
- C. Clean masonry debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

- D. Sweep and rake adjacent pavement and grounds to remove masonry debris. Where necessary, pressure wash surfaces to remove mortar, dust, dirt, and stains.

3.9 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare test reports. Coordinate with inspectors and provide access. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

END OF SECTION

SECTION 042000

UNIT MASONRY

(PART OF WORK OF SECTION 040001 - MASONRY WORK, FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Face brick.
2. Embedded flashing.
3. Stone trim units.
4. Mortar and grout.
5. Reinforcing steel, masonry joint reinforcement, ties and anchors.

- B. Alternates: Not Applicable.

- C. Items To Be Installed Only:

1. Section 055000 - METAL FABRICATIONS:
 - a. Lintels, miscellaneous metal and iron sleeves, anchors, inserts and plates to be built into masonry walls.
2. Section 055150 - METAL RAILINGS:
 - a. Miscellaneous metal and iron sleeves, anchors, inserts and plates to be built into masonry walls.
3. Section 061000 - ROUGH CARPENTRY:
 - a. Wood nailers and blocking built into masonry.
4. Section 083110 - ACCESS DOORS AND FRAMES
 - a. Access doors and frames in masonry openings.

- D. Items To Be Furnished Only:

1. Section 033000 - CAST-IN-PLACE CONCRETE:
 - a. Dovetail slots for masonry anchors.
2. Section 051200 - STRUCTURAL STEEL FRAMING:
 - a. Anchor sections of adjustable masonry anchors for connecting to structural frame.

- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 079200 - JOINT SEALANTS for sealing control and expansion joints in unit masonry.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
- C. Samples for Verification: For each type and color of the following:
 - 1. Face brick, in the form of straps of five or more bricks.
 - 2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
 - 3. Stone trim.
 - 4. Weep holes/vents.
 - 5. Accessories embedded in masonry.
- D. Qualification Data: For testing agency.
- E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
 - 1. Masonry units:
 - a. Include material test reports substantiating compliance with requirements.
 - b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include brand, type, and name of manufacturer.
 - 3. Mortar mixes. Include description of type and proportions of ingredients.
 - 4. Grout mixes. Include description of type and proportions of ingredients.
 - 5. Reinforcing bars.
 - 6. Joint reinforcement.
 - 7. Anchors, ties, and metal accessories.
- F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports, per ASTM C 780 for mortar mixes required to comply with property specification.
 - 2. Include test reports, per ASTM C 1019 for grout mixes required to comply with compressive strength requirement.
- G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Preconstruction Testing Service: The Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by the Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
 - 1. Prism Test: For each type of construction required, per ASTM C 1314.
- E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
- F. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 for mockups.
 - 1. Build sample panels for typical exterior and interior walls in sizes approximately 48 inches long by 48 inches high by full thickness.
 - 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 - 3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 - 4. Protect approved sample panels from the elements with weather-resistant membrane.
 - 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Agenda shall include protection of air barrier membrane during construction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

- A. Protection of Air Barrier Membrane: During construction, protect air barrier membrane from penetrations which allow air to pass through air barrier assemblies. Engage original installer to repair damage promptly using identical materials and methods of installation, and to the satisfaction of the Architect.
- B. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 - 2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- C. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- E. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

- F. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 BRICK

- A. Face Brick: ASTM C 216, Grade SW, Type FBS.
1. Trade Reference and Color: To match existing.
 2. Size (Actual Dimensions): To match existing.
 3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
 4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 5. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
- B. General: Provide shapes indicated and as follows:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces.
 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
 5. Units which are sawn and less than one-half full size shall not be used.

2.3 STONE TRIM UNITS

- A. Granite: Provide granite complying with ASTM C 615 and NBGQA's "Specifications for Architectural Granite" and as follows:
1. Varieties, Cut and Finish: As selected by Architect.
- B. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces.
1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."

2.4 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Provide aggregate for mortar and grout, cement, and lime that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 1. Available Products:
 - a. LanXess; Bayferrox Iron Oxide Pigments.
 - b. Davis Colors; True Tone Mortar Colors.
 - c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.
- E. Aggregate for Mortar: ASTM C 144. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
- F. Aggregate for Grout: ASTM C 404.
- G. Water: Potable.

2.5 REINFORCEMENT

- A. Masonry Joint Reinforcement, General: ASTM A 951.
 - 1. Interior Walls: Mill-galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size and Spacing: As required by Code.
 - 4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
 - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
 - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
 - 3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 316.
 - 4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
 - 5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 6. Stainless Steel Bars: ASTM A 276 or ASTM A 666, Type 304.
- B. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel. Mill-galvanized wire may be used at interior walls, unless otherwise indicated.

C. Partition Top Anchors: 0.097-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

D. Stone Anchors: Fabricate dowels, cramps, and other stone anchors from stainless steel.

2.7 MISCELLANEOUS ANCHORS

A. Anchor Bolts: L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.8 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with Section 076200 - SHEET METAL FLASHING AND TRIM and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.40 mm) thick.
2. Configuration: Provide continuous flashing including preformed outside, inside corners, and end dams with smooth uninterrupted soldered seams and hemmed edges to maintain continuity. See drawings for profiles required.

B. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 – SHEET METAL FLASHING AND TRIM.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates. Verify compatibility between flashing materials and substrates.

D. Transition Strips: Provide long-term compatible 6" wide transition strips to seal embedded flashing terminations to air barrier membrane.

E. Drip Edge: Provide type 316, 0.016 inch (0.40 mm) thick stainless steel drip edge plates with factory applied adhesive strip for all through-wall flashing conditions. Provide preformed outside and inside corner drip plate corners with smooth uninterrupted soldered seams and hemmed drip edges to maintain continuity. Custom sizes will be required see drawings for profiles required.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

- D. Weep/Vent Products: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity. Provide strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings or equivalent. Available products:
 - 1. Advanced Building Products Inc.; Mortar Break II.
 - 2. Archovations, Inc.; CavClear Masonry Mat.
 - 3. Hohmann & Barnard; MortarTrap.
 - 4. Mortar Net USA, Ltd.; Mortar Net.

2.10 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 1. Available Manufacturers:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.11 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Limit cementitious materials in mortar to portland cement and lime.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type S.
 - 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- C. Pigmented Mortar: Use colored cement product. Pigments shall not exceed 10 percent of portland cement by weight.
- D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed. Do not use units cut to less than one-half size.
- E. Do not install concrete masonry units with more than 5 percent damage to the face. Do not install brick units which will show defects after installation.
- F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- G. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs. Prior to installation review bond pattern with Architect.
- C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- G. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078440 – FIRE-RESISTIVE JOINT SYSTEMS.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and concrete masonry units as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Allow cleaned surfaces to dry before setting.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 CAVITY WALLS

- A. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- C. Coordinate and allow access for air and vapor barrier membrane installed in cavity under Section 072700 - AIR BARRIERS.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches. Space reinforcement not more than 16 inches o.c.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers with masonry-veneer anchors to comply with the following requirements:
1. Fasten screw-attached anchors through insulation and sheathing to wall framing and to concrete and masonry backup as applicable with metal fasteners of type indicated.
 2. Embed tie sections in masonry joints. Provide air space indicated on the Drawings between back of masonry veneer and face of insulation.
 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 4. Space anchors as required by Code.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 2. Install preformed control-joint gaskets designed to fit standard sash block.
 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick made from clay or shale as follows:
1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
 3. Build in compressible joint fillers where indicated.
 4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 - JOINT SEALANTS.

- D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 - JOINT SEALANTS but not less than 3/8 inch.

- 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

- B. Install flashing as follows, unless otherwise indicated:

- 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
 - 3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge covered with elastomeric membrane, lapping at least 4 inches.
 - 4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 5. Install air barrier transition strips to seal embedded flashings in masonry to air barrier membrane in accordance with Section 072700 – AIR BARRIERS.

- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

- D. Install metal drip edge plate in accordance with architectural details and manufacturer's requirements.

- E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

- 1. Use specified weep/vent products to form weep holes.
 - 2. Space weep holes 24 inches o.c., unless otherwise indicated.

- F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

- G. Install vents in head joints in exterior wythes at spacing indicated.

3.12 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
- B. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof. Test types as determined by the independent testing and inspection agency.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, around penetrations and where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 - 6. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 7. Clean stone trim to comply with stone supplier's written instructions.

3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
1. Crush masonry waste to less than 4 inches in each dimension.
 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 - EARTHWORK.
 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off the Site.

END OF SECTION

SECTION 050001

MISCELLANEOUS AND ORNAMENTAL IRON

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert name of sub-bidder)

MASS. STATE PROJECT: ((Insert project number from top of page))

SUB-BID FOR SECTION: 050001 –MISCELLANEOUS AND ORNAMENTAL IRON

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Awarding Authority.
3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Awarding Authority in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

A101	SIDEWALK PLANS - DEMO AND PROPOSED
A102	PARTIAL ROOF PLAN - NORTH
A103	PARTIAL ROOF PLAN - SOUTH
A110	ENLARGED ENTRY PLAN
A201	EXTERIOR ELEVATIONS
A202	EXTERIOR ELEVATIONS
A504	GUARDRAIL DETAILS
A505	SHIP STAIR DETAILS

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A511	SIDEWALK SECTIONS - DEMO AND PROPOSED
A512	SIDEWALK SECTIONS
A513	SIDEWALK SECTIONS, ELEVATIONS, AND DETAILS

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. All Work in Section 055000 - METAL FABRICATIONS.
 2. All Work of Section 055150 - METAL RAILINGS.
- B. Alternates: Not Applicable.

END OF SECTION

SECTION 051200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Structural Framing
 - 2. Precast bearing angles
 - 3. Reinforcing steel on roof trusses to facilitate railing installation.
- B. Alternates: Not Applicable.
- C. Items To Be Furnished Only:
 - 1. Not Applicable
- D. Related Sections:
 - 1. Section 055013 – Miscellaneous Metal Fabrications

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using AISC's "Manual of Steel Construction, Load and Resistance Factor Design," Volume 2, Part 9.
 - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For Installer, fabricator, professional engineer, testing agency.
- E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Direct-tension indicators.
 - 4. Tension-control, high-strength bolt-nut-washer assemblies.
 - 5. Shop primers.
 - 6. Nonshrink grout.
- F. Connection Design Calculations: For connections not specifically designed and detailed by the Designer, submit to Designer complete design calculations performed by a professional engineer registered in Massachusetts, properly coordinated with Shop Drawings.
- G. Source quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."
- B. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
 - 3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" and "Load and Resistance Factor Design Specification for Structural Steel Buildings."
 - 4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
 - 5. AISC's "Specification for Allowable Stress Design of Single-Angle Members" and "Specification for Load and Resistance Factor Design of Single-Angle Members."
 - 6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles, Plates, Bars: ASTM A36
- C. All other structural shapes: ASTM A 572/A 572M, Grade 50 unless indicated on drawings.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
- F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.
- C. Threaded Rods: ASTM A 193/A 193M, grade as applicable, hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.3 PRIMER

- A. Primer: SSPC-Paint 25, Type II, iron oxide, zinc oxide, raw linseed oil, and alkyd.
- B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.
- C. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" as applicable.
 - 1. Camber structural-steel members where indicated.
 - 2. Pitch and splice structural steel roof members where indicated.
 - 3. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. The Contractor shall design and detail all connections not specifically detailed on Drawings. Fabrication and erection details shall supplement and be consistent with details shown on the Drawings. Do not use one-sided or other eccentric connections, except where they are specifically detailed and in isolated cases where approval of Designer is obtained.
- F. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.
- G. Corrective Work: Structural steel elements having fabrication errors and/or which do not satisfy tolerance limits shall not be incorporated in finished work. Such elements may be corrected if permitted by Designer and/or Testing Agency. Submit to Designer drawings showing details of proposed corrective work. These drawings shall be approved by Designer prior to performing corrective work. Corrective work shall be performed in accordance with requirements of Contract Documents. Corrective work and any retesting which may be required shall be at Contractor's expense.

- H. Identification: Structural steel members shall have an assigned position and identification mark or symbol, clearly indicated on each piece near one end. Marks shall correspond to that given on Shop Drawings and erection drawings related to specific members.
- I. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 STEEL PRIMERS AND FINISHES

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for The Society for Protective Coatings (SSPC) surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 10/NACE No. 2, "Near White Metal Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 6, "Commercial Blast Cleaning."
 - 3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be field welded, embedded in concrete or masonry, unless otherwise indicated. Extend priming of partially embedded members to a depth of 2 inches.

4. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 5. Comply with SSPC-PA 2, "Measurement of Dry Coating Thickness with magnetic Gages."
- C. Zinc-Rich Primer: Urethane zinc rich primer compatible with topcoat Specified in Section 099000 - PAINTING AND COATING. Provide primer with a VOC content of 340 g/L (2.8 lb/gal.) or less per OTC ozone standards. Provide Tnemec Series 394 Perimerprime or PPG PMC Amercoat 5105 for exposed steel to be fireproofed, or Tnemec 901K97 or 90-97 or PPG PMC Amercoat 68HS for exposed steel to be finish painted at 3.0 mils DFT or equal by DuPont, Carboline, or Sherwin-Williams.
- D. Galvan Primer for Exposed Steel to Receive Multi-Coat Shop-Applied Coating: Tnemec 901K97 or 90-97 urethane zinc rich primer at 3.0 to 3.5 mils DFT, topcoated in shop with Tnemec Endurashield Series 73 or PPG PMC Amercoat 68 HS Primer at 3.0 to 5.0 mils DFT or equal by DuPont, Carboline, or Sherwin-Williams.
- E. Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards. The galvanizing bath shall contain high grade zinc and other earthly materials. Fill vent holes and grind smooth after galvanizing.
1. Galvanizing shall exhibit a rugosity (smoothness) not greater than 4 rug (16-20 microns of variation) when measured by a profilometer over a 1 inch straight line on the surface of architectural and structural elements that are less than 24 pounds per running foot. Profilometer shall be capable of operating in 1 micron increments.
 2. Surface blasting prior to application of factory-applied post galvanizing wet coatings will produce a high rugosity and shall not be acceptable.
- F. Shop Priming for Galvanized Steel: For steel indicated to be galvanized and primed, provide hot-dip galvanizing and factory-applied polyamide epoxy primer, 2.0 to 4.0 mils dry film thickness, certified OTC/VOC compliant less than 2.8 lbs/gal. and conforming to EPA and Commonwealth of Massachusetts requirements. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations and as recommended by the coating manufacturer.
1. Basis of Design: Duncan Galvanizing; Primergalv system.
- G. Shop Priming and Finish for Galvanized Steel: For steel indicated to be galvanized, shop primed and topcoated, provide factory-applied architectural coating over primed galvanized steel as previously referenced. Apply coating at the galvanizer's plant, in a controlled environment meeting applicable EPA and Commonwealth of Massachusetts regulations. Apply the galvanizing and coating within the same facility and provide single-source responsibility for galvanizing, priming and finish coating.
1. Basis of Design: Duncan Galvanizing; Colorgalv 10 system.
- 2.8 SOURCE QUALITY CONTROL
- A. Engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and other inspection procedures, at testing agency's option.
- E. The edges of material to be welded will be ultrasonically examined for evidence of laminations, inclusions or other discontinuities. The extent to which such defects will be permitted and the extent of repair permitted shall be determined by the inspector and made in accordance with ASTM A6, Paragraph 9. Repairs made by welding shall be done in compliance with the requirements of the "Structural Welding Code" and the accepted welding procedures.
- F. 10% of all bolted connections shall be tested for proper torque in the bolts. At least 20 % of all fillet welds shall be tested with the magnetic particles and 100% of such welds shall be inspected visually, 100% of full penetration welds shall be inspected by ultrasonic testing.
- G. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
 - 1. Elevations shall be verified by a surveyor licensed in the Commonwealth of Massachusetts.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- B. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- D. Splice members only where indicated.
- E. Do not use thermal cutting during erection unless approved by Designer. Finish thermally cut sections within smoothness limits in AWS D1.1.
- F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- G. Openings in Structural Steel: Cutting of openings differing from or in addition to those shown on approved shop drawings will not be permitted without written approval of Designer.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Tension Controlled, unless otherwise indicated.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by the owner for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.
- B. Commissioning Authority: Cooperate with the Commissioning Authority engaged by the owner for field quality control activities for the Work of this Section. Refer also to Section 019115 - FACILITY EXTERIOR ENCLOSURE COMMISSIONING.
- C. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
- D. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.
- E. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- F. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
 - 1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and other inspection procedures at testing agency's option:
- G. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- H. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

(PART OF WORK OF SECTION 050001 - MISCELLANEOUS AND ORNAMENTAL IRON,
FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following. Requirements for materials, hot-dip galvanizing, and shop-applied primers are included with each item as applicable.

1. Miscellaneous steel framing and supports:

- a. Steel framing and supports for applications where framing and supports are not specified in other Sections; galvanized at exterior locations and in exterior walls.

2. Skateboard deterrent plates, stainless steel.

3. Ladders:

- a. Steel ships' ladders, galvanized.

- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE for lintels, sleeves, anchors, inserts, plates and similar items.
2. Section 051200 - STRUCTURAL STEEL FRAMING for structural steel items.
3. Section 055150 - METAL RAILINGS for steel stairs, handrails, and guardrails.
4. Section 099000 - PAINTING AND COATING for field painting work of this section.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design ladders and miscellaneous framing and supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- C. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by

preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each product.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 2. Provide templates for anchors and bolts specified for installation under other Sections.
 3. Where fabrications are to receive sprayed-on fireproofing, include statement that primer is compatible with fireproofing proposed for use.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Welding certificates.
- E. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal fabrications that are similar to those indicated for this Project in material, design, and extent.
- C. Welding: Qualify procedures and personnel according to the following:
 1. AWS D1.1, "Structural Welding Code--Steel."
 2. AWS D1.3, "Structural Welding Code--Sheet Steel."
- D. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304 at interior, Type 316L at exterior.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304 at interior, Type 316L at exterior.
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- F. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

- C. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- D. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency. Anchors shall have an ICC-ES report with approval for use in cracked concrete.
 - 1. Acceptable Manufacturers: Kwik-Bolt TZ by Hilti, Inc., TruBolt Wedge Anchor by ITW Red Head, Power-Stud+ by Powers Fasteners, or Strong Bolt by Simpson.
- E. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Zinc-Rich Primer: Urethane zinc-rich primer compatible with topcoat Specified in Section 099000 - PAINTS AND COATINGS.
 - 1. Basis of Design: Tnemec; Series 394 PerimePrime.
 - 2. VOC Content: 250 g/L or less.
- D. Galvanizing Repair Paint: High-zinc-dust-content (95% by weight) paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 - 1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Duncan Galvanizing; ZiRP.
 - b. ZRC Worldwide; Galvilite Galvanizing Repair, low VOC type.
 - 2. VOC Content: 250 g/L or less.
- E. Isolation Coating (Bituminous Paint): ASTM D 1187, cold-applied asphalt emulsion, VOC compliant, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
 - 1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dayton Superior; 1107 Advantage Grout.
 - b. Sika; SikaGrout 212.
 - 2. VOC Content: 0 g/L.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts if units are installed after concrete is placed.

2.6 METAL SHIPS' LADDERS

- A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers, pipe and tube railings, and bar grating treads, unless otherwise indicated. Provide brackets and fittings for installation.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.8 STEEL PRIMERS AND FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Urethane Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush Off Blast Cleaning."
 - 3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be field welded, embedded in concrete or masonry, unless otherwise indicated. Extend priming of partially embedded members to a depth of 2 inches.
 - 4. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 5. Comply with SSPC-PA 2, "Measurement of Dry Coating Thickness with magnetic Gages."
- B. Zinc-Rich Primer: Urethane zinc-rich primer compatible with topcoat Specified in Section 099000 - PAINTS AND COATINGS.
 - 1. Basis of Design: Tnemec; Series 394 PerimePrime.
 - 2. VOC Content: 340 g/L or less.

2.9 HOT-DIP GALVANIZING

- A. Hot-Dip Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process.
 - 1. Basis-of-Design: Duragalv by Duncan Galvanizing.
 - 2. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware.

3. Provide thickness of galvanizing specified in referenced standards.
4. Galvanizing bath shall contain special high grade zinc and other earthy materials.
5. Fill vent holes after galvanizing, if applicable, and grind smooth.

2.10 HOT-DIP GALVANIZING AND FACTORY-APPLIED PRIMER

- A. Hot-Dip Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process.
1. Basis-of-Design: Duragalv by Duncan Galvanizing.
 2. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware.
 3. Provide thickness of galvanizing specified in referenced standards.
 4. Galvanizing bath shall contain special high grade zinc and other earthy materials.
 5. Fill vent holes after galvanizing, if applicable, and grind smooth.
- B. Factory-Applied Primer over Galvanized Steel: Provide factory-applied prime coat, certified OTC/VOC compliant less than 2.8 lbs/gal. and conforming to EPA and local requirements. Apply primer within 12 hours after galvanizing at the same galvanizer's plant in a controlled environment meeting applicable environmental regulations and as recommended by the primer coating manufacturer. Primer coat shall exhibit a rugosity (smoothness) not greater than 4 rug (16-20 microns of variation) when measured by a profilometer over a 1 inch straight line on the surface of architectural and structural elements that are less than 24 pounds per running foot. Profilometer shall be capable of operating in 1 micron increments. Blast cleaning of the surface is unacceptable for surface preparation. Primer shall have a minimum two year re-coat window for application of finish coat. Coatings must meet or exceed the following performance criteria as stipulated by the coatings manufacturer:
1. Basis-of-Design: Primergalv by Duncan Galvanizing.
 2. Abrasion Resistance: ASTM D 4060 (CS17 Wheel, 1,000 grams load).1kg load, 200 mg loss.
 3. Adhesion: ASTM D4541, 1050 psi.
 4. Corrosion Weathering: ASTM D5894, 13 cycles, 4,368 hours; rating 10 per ASTM D714 for blistering and rating 7 per ASTM D610 for rusting.
 5. Direct Impact Resistance: ASTM D2794, 160 in. lbs.
 6. Flexibility: Method: ASTM D522, 180 degree bend, 1 inch mandrel, passes.
 7. Pencil Hardness: ASTM D3363, 3B.
 8. Moisture Condensation Resistance: ASTM D4585, 100 degrees F, 2000 hours; passes, no cracking or delamination.
 9. Dry Heat Resistance: Method: ASTM D2485, 250 degrees F.
 10. Warranty: Provide galvanizer's warranty that materials will be free from 10 percent or more visible rust for a period of 20 years.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of isolation coating.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touch-Up and Repair for Galvanized Surfaces: For damaged and field-welded metal coated surfaces, clean welds, bolted connections and abraded areas.
 - 1. For galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A 780, modified to 95 percent zinc in dry film. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A 123 or A 153 as applicable. Touch-up of galvanized surfaces with silver paint, brite paint, or aluminum paints is not acceptable.
 - 2. For factory-applied finish coatings, field-touch-up shall be performed by factory approved personnel. Touch-up shall be such that repair is not visible from a distance of 6 feet.

3. A touch-up repair kit or touchup instructions shall be provided to the Owner for each type of factory-applied finish.

END OF SECTION

SECTION 055150

METAL RAILINGS

(Part of Work of Section 050001 - MISCELLANEOUS AND ORNAMENTAL IRON,
Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Steel handrails, guardrails, and railings, at exterior locations.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 033000 - CAST-IN-PLACE CONCRETE for sleeves, anchors, inserts, plates and similar items.
 - 2. Section 061000 - ROUGH CARPENTRY for wood blocking for anchoring railings.
 - 3. Section 099000 - PAINTING AND COATING for field painting work of this section.

1.3 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and Code required loads and stresses within limits and under conditions indicated:
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.5 SUBMITTALS

- A. Product Data: For metal railings and the following:
 - 1. Paint products, including printed statement of VOC content.
 - 2. Grout, including printed statement of VOC content.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Delegated-Design Submittal: For stairs and railings indicated to comply with performance requirements and design criteria, including structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- E. Welding certificates.
- F. Qualification Data: For professional engineer.

1.6 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal stairs and railings that are similar to those indicated for this Project in material, design, and extent.
- C. Installer Qualifications: Fabricator of products.
- D. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails, unless otherwise indicated.
 - 1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn)]
- C. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M[either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial steel, Type B, or structural steel, Grade 33, unless another grade is required by design loads.
- E. Galvanized Malleable Cast Iron: ASTM A447 with ASTM A153 galvanizing

2.3 FASTENERS

- A. General: Provide stainless steel Type 316 for exterior use and where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 099000 - PAINTING AND COATING.
- C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Available Products: Dupont Ganicin, Keeler and Long Urethane Zinc Rich Primer, or Tnemec Series 394 PerimePrime.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

1. Provide interior, field-applied paint with a VOC content of 250 g/L or less, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Provide complete assemblies, including metal framing, railings, clips, brackets, bearing plates, and other components necessary to support and anchor railings to supporting structure.

1. Join components by welding, unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously, unless otherwise indicated.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 METAL RAILINGS

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

- C. Form changes in direction of railings as detailed on the Drawings.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 1. Connect posts to stair framing by direct welding, unless otherwise indicated.
 - 2. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
 - 3. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
- H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.7 STEEL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal railings after assembly.
- C. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
 - 1. Interior Railings (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- E. Apply shop primer to uncoated surfaces of metal railing components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal railings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal railings. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal railings by welding railing framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING METAL RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding directly to steel supporting members.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 3. For hollow masonry anchorage, use toggle bolts.

4. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- C. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 061000

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Wood blocking, cants, and nailers.
 2. Plywood backing panels.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
1. Section 042000 - UNIT MASONRY for wood nailers and blocking built into masonry.
 2. Section 061600 - SHEATHING for plywood and gypsum sheathing.
 3. Section 064020 - INTERIOR ARCHITECTURAL WOODWORK for interior woodwork not specified in this Section.
 4. Section 092110 - GYPSUM BOARD ASSEMBLIES for sheet metal backing.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.
1. Indicate component materials and dimensions and include construction and application details.
 2. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 3. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

- 1. Salvaged wood products are exempt from FSC requirements for LEED certifications.

- B. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

- 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
 - 4. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

- C. Plywood Panels:

- 1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
 - 2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
 - 3. Factory mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

- 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - a. Use Borate or Copper Azule treatments. Product shall not contain creosote, arsenic or pentachlorophenol.

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 18 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.
 - C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
 - D. Application: Treat items indicated on Drawings, and the following:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete in exterior walls.
 - E. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Hoover Treated Wood Products; PyroGuard.
 2. Koppers Performance Chemicals; LifeWood MicroPro Treatment.
 3. Sustainable Northwest Wood; Pressure Treated Wood with Copper Azule.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For all interior use materials, and where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 1. Treatment shall not promote corrosion of metal fasteners.
 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
 5. Product shall not contain creosote, arsenic or pentachlorophenol.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide FRTW lumber for support or attachment of other construction, including, but not limited to, the following: Rooftop equipment bases and support curbs, blocking, cants, nailers, furring and grounds.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.

2.5 PANEL PRODUCTS

- A. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch.
- B. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5; except provide stainless steel complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2, where in contact with pressure-preservative treated wood or when exposed to exterior conditions.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesive, Including Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Henkel Corp.; Loctite PL Premium Polyurethane Construction Adhesive.
 - b. Henkel Corp.; OSI SF450 Heavy Duty Subfloor Construction Adhesive.
 2. Low-Emitting Materials: Provide adhesives in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. VOC Content: 70 g/L or less.
 4. Do not use adhesives that contain urea formaldehyde.
 5. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Apply field treatment complying with AWWA M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach carpentry work as indicated and according to applicable codes and the following:
 1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 2. ICC-ES evaluation report for fastener.
- E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.
- F. Use fasteners of appropriate type and length. Pre-drill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install as required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION

SECTION 070001

WATERPROOFING, DAMPPROOFING AND CAULKING

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert name of sub-bidder)

MASS. STATE PROJECT: ((Insert project number from top of page))

SUB-BID FOR SECTION: 070001 – WATERPROOFING, DAMPPROOFING
AND CAULKING.

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of Awarding Authority.
3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Awarding Authority in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

A001	BASEMENT KEY PLAN
A002	FIRST FLOOR KEY PLAN AND CEILING SCOPE
A100	BASEMENT LEVEL RCPS - DEMO AND PROPOSED
A101	SIDEWALK PLANS - DEMO AND PROPOSED
A110	ENLARGED ENTRY PLAN
A510	SIDEWALK SECTIONS - DEMO AND PROPOSED
A511	SIDEWALK SECTIONS - DEMO AND PROPOSED
A512	SIDEWALK SECTIONS

A513 SIDEWALK SECTIONS, ELEVATIONS, AND DETAILS

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. All Work of Section 071400 - FLUID-APPLIED WATERPROOFING
 - 2. All Work of Section 079200 - JOINT SEALANTS

- B. Alternates: Not Applicable.

END OF SECTION

SECTION 070002

ROOFING AND FLASHING

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert name of sub-bidder)

MASS. STATE PROJECT: ((Insert project number from top of page))

SUB-BID FOR SECTION: 070002 – ROOFING AND FLASHING

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Awarding Authority.
3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Awarding Authority in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

A002	FIRST FLOOR KEY PLAN AND CEILING SCOPE
A003	SECOND FLOOR KEY PLAN AND CEILING SCOPE
A004	ROOF KEY PLAN – DEMO & EQUIPMENT SCHEDULE
A102	PARTIAL ROOF PLAN - NORTH
A103	PARTIAL ROOF PLAN - SOUTH
A110	ENLARGED ENTRY PLAN
A201	EXTERIOR ELEVATIONS
A202	EXTERIOR ELEVATIONS

A501	ROOF DETAILS
A502	ROOF DETAILS
A503	TYPICAL ROOF DETAILS
A504	GUARDRAIL DETAILS
A505	SHIP STAIR DETAILS

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. All Work of Section 075019 - PREPARATION FOR REROOFING
 2. All Work of Section 075400 - THERMOPLASTIC MEMBRANE ROOFING
 3. All Work of Section 076200 - SHEET METAL FLASHING AND TRIM
- B. Alternates: Not Applicable.

END OF SECTION

SECTION 071400

FLUID-APPLIED WATERPROOFING

(PART OF WORK OF SECTION 070001 - Waterproofing, Dampproofing and Caulking, FILED SUB-BID
REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Modified polymer waterproofing membrane.
 - 2. Molded sheet drainage panels.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 079200 - JOINT SEALANTS for joint-sealant materials and installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Samples: For the following products:
 - 1. 12-by-12-inch square of waterproofing and reinforcing strip.
- C. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- D. Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is acceptable to waterproofing manufacturer to install manufacturer's products.

- B. Source Limitations: Obtain waterproofing materials, protection course, and molded-sheet drainage panels through one source from a single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 deg F.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that fail to remain watertight within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MODIFIED POLYMER WATERPROOFING

- A. Reinforced, Modified Polymer Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.
 - 1. Basis of Design: Carlisle Coatings & Waterproofing Inc.; MiraSeal.
 - 2. Thickness: 60 mil.

2.2 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials recommended by manufacturer to be compatible with one another and with waterproofing, as demonstrated by waterproofing manufacturer, based on testing and field experience.
- B. Reinforcing: Manufacturer's recommended fiberglass mesh or polyester fabric.
- C. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing, complying with ASTM C 920 Type M, Class 25; Grade NS for sloping and vertical applications or Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.
 - 1. Backer Rod: Closed-cell polyethylene foam.

2.3 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to 1 side with a polymeric film bonded to the other side of a 3-dimensional (studded), nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).
 - 1. Basis of design: Carlisle Coatings & Waterproofing Inc.; CCW MiraDRAIN.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

- D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

- A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.
 - 1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
 - 2. Adhere strip of elastomeric sheet to substrate in a layer of hot rubberized asphalt. Extend elastomeric sheet a minimum of 6 inches on each side of moving joints and cracks or joints and cracks exceeding 1/8 inch thick, and beyond deck drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
 - 3. Embed strip of reinforcing fabric into a layer of hot rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches on each side of nonmoving joints and cracks not exceeding 1/8 inch thick, and beyond roof drains and penetrations.
 - a. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.

3.4 MEMBRANE APPLICATION

- A. Apply waterproofing according to ASTM C 898 and manufacturer's written instructions.
- B. Start installing waterproofing in presence of manufacturer's technical representative.
- C. Apply primer over prepared substrate.
- D. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.
 - 1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 60 mils and a minimum dry film thickness of 50 mils at any point.
 - 2. Apply waterproofing to prepared wall terminations and vertical surfaces.
 - 3. Verify wet film thickness of waterproofing every 100 sq. ft.

3.5 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate according to manufacturer's written instructions. Use methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.6 CLEANING AND PROTECTION

- A. Protect waterproofing from damage and wear during remainder of construction period.

- B. Protect installed waterproofing from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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SECTION 072100

THERMAL INSULATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Rigid insulation below grade.
- B. Alternates: Not Applicable.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 033000 - CAST-IN-PLACE CONCRETE for underslab vapor barrier.
 - 2. Section 075400 - THERMOPLASTIC MEMBRANE ROOFING for roofing insulation.
 - 3. Section 092110 - GYPSUM BOARD ASSEMBLIES for acoustic insulation in gypsum board assemblies.
 - 4. Division 22 - PLUMBING for plumbing insulation.
 - 5. Division 23 - HEATING, VENTILATING, AND AIR CONDITIONING for mechanical insulation.

1.3 SUBMITTALS

- A. Product Data: Manufacturer product data, installation instructions, performance criteria, and product limitations for each type of product indicated.
- B. Qualification Data: For Testing Agency.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

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- C. Testing Agency Qualifications: An independent agency qualified as a "Certified Infrared Thermographer" per ASNT SNT-TC-1A guidelines, Level I certification minimum.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store in a dry and secure location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver materials to Project site before installation time.
 - 3. Complete installation and concealment of materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 RIGID INSULATION

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. DiversiFoam Products.
 - 2. Dow Chemical Company.
 - 3. Owens Corning.
- B. Extruded-Polystyrene (XPS) Board Insulation: ASTM C 578, square edged of type, density, and compressive strength indicated below:
 - 1. For horizontal applications, pedestrian traffic, Type VII, 2.2-lb/cu. ft. minimum density and 60-psi minimum compressive strength.
- C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.2 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
 - 1. Low-Emitting Materials: Provide interior adhesives in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 2. Do not use adhesives that contain urea formaldehyde.
 - 3. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.
- B. Tape: Adhesive tape recommended by insulation manufacturer, to tape joints and tears in faced insulation.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

3.4 INSTALLATION OF BELOW-GRADE INSULATION

- A. On horizontal surfaces, loosely lay rigid insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports.
- B. Infrared Camera Survey: Contractor shall engage a testing agency to perform an infrared camera scan of walls, floors, and ceilings to determine where insulation and air barrier are not continuous, after insulation has been installed, but prior to plaster patching or new gypsum board installation.
 - 1. Provide complete digital report with images of test results with recommendations for repairs.
- C. Repair or replace work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

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3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. 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 075019

PREPARATION FOR REROOFING

(PART OF WORK OF SECTION 070002 - Roofing and Flashing, FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Roof tear-off.
 - 2. Temporary roofing membrane.
 - 3. Roof re-cover preparation.
 - 4. Removal of base flashings.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 061000 - ROUGH CARPENTRY for blocking, cants, nailers and miscellaneous wood materials.
 - 2. Section 075400 - THERMOPLASTIC MEMBRANE ROOFING for new roofing materials.
 - 3. Section 076200 - SHEET METAL FLASHING AND TRIM for new flashing materials.
 - 4. Section 230001 - HEATING, VENTILATING, AND AIR CONDITIONING for HVAC equipment removal and reinstallation.
 - 5. Section 260001 - ELECTRICAL for electrical equipment disconnection and reconnection.

1.3 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Existing Membrane Roofing System: Roofing membrane, roof insulation, surfacing, and components and accessories between deck and top surface of roofing system.
- C. Roof Re-Cover Preparation: Existing roofing membrane that is to remain and be prepared for reuse.

- D. Roof Tear-Off: Removal of existing membrane roofing system from deck.
- E. Partial Roof Tear-Off: Removal of a portion of existing membrane roofing system from deck or removal of selected components and accessories from existing membrane roofing system.
- F. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.
- G. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Temporary Roofing: Include Product Data and description of temporary roofing system. If temporary roof will remain in place, submit surface preparation requirements needed to receive permanent roof, and submit a letter from roofing membrane manufacturer stating acceptance of the temporary membrane and that its inclusion will not adversely affect the roofing system's resistance to fire and wind.
- C. Fastener pull-out test report.
- D. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.
- E. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer of new membrane roofing system [approved by warrantor of existing roofing system to work on existing roofing].
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Reroofing Conference: Conduct conference at Project site. Comply with requirements in Division 01. Review methods and procedures related to roofing system including, but not limited to, the following:
 - 1. Meet with the Owner, Architect, the Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects reroofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing system tear-off and replacement, including manufacturer's written instructions.
 - 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. Examine existing roof drains and roof drainage during each stage of reroofing, and roof drain plugging and plug removal requirements.
 - 5. Examine existing deck substrate conditions and base flashing substrate for reuse.
 - 6. Review existing deck removal procedures and Owner notifications.

7. Review structural loading limitations of roof deck during reroofing.
8. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect reroofing.
9. Review HVAC shutdown and sealing of air intakes.
10. Review shutdown of fire-suppression, -protection, and -alarm and -detection systems.
11. Review procedures for asbestos removal and discovery of asbestos-containing materials.
12. Review existing conditions that may require notification of Architect before proceeding.
13. Review governing regulations and requirements for insurance and certificates if applicable.
14. Review temporary protection requirements for existing roofing system that is to remain during and after installation.

1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately below reroofing area. Conduct reroofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.
 1. Provide temporary protection, including dust and noise control, of existing building affected by reroofing procedures.
 2. Coordinate work activities daily with Owner so Owner can place additional protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area.
 3. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired deck area.
- B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- D. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
- E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
- F. Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.
 1. Hazardous materials will be removed by Owner before start of the Work. Existing roof will be left no less watertight than before removal.
 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect. Hazardous materials will be removed by Owner under a separate contract.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty. Notify warrantor before proceeding.

1. Notify warrantor of existing roofing system on completion of reroofing, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 INFILL MATERIALS

- A. Use infill materials matching existing membrane roofing system materials unless otherwise indicated. Infill materials are specified in the following Sections:

1. Section 075400 – THERMOPLASTIC MEMBRANE ROOFING.

2.2 TEMPORARY ROOFING MATERIALS

- A. Design and selection of materials for temporary roofing are responsibilities of Contractor.

2.3 RECOVER BOARDS

- A. Recover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates listed in FM Approval's "Approval Guide," designed for fastening recover boards to deck.

2.4 AUXILIARY REROOFING MATERIALS

- A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of [existing and]new membrane roofing system.
- B. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approval's "Approval Guide."
- C. Metal Flashing Sheet: Metal flashing sheet is specified in Section 076200 - SHEET METAL FLASHING AND TRIM.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect existing membrane roofing system that is indicated not to be reroofed.
- B. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
 1. If necessary to deactivate all or a portion of fire-detection system, provide a fire watch during work and for 2 hours after restart of fire-detection system.

- C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
 - 1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.
- E. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

- A. General: Notify the Architect and Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.
- B. Remove aggregate, pavers and accessories from roofing membrane.
 - 1. Store and protect pavers and accessories for reuse. Discard cracked pavers.
- C. Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck.
- D. Partial Roof Tear-Off: Remove existing roofing membrane and immediately check for presence of moisture by visually observing boards and roof insulation that will remain.
 - 1. Coordinate with Owner's inspector to schedule times for tests and inspections immediately after membrane removal.
 - 2. Remove wet or damp boards and roof insulation. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of membrane roofing system.
- B. Concrete Deck: Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263 or by pouring 1 pint of hot roofing asphalt on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if moisture condenses under the plastic sheet or if asphalt test sample foams or can be easily and cleanly stripped after cooling.
- C. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.
- D. Replace deck as indicated on Drawings.

3.4 INFILL MATERIALS INSTALLATION

- A. Immediately after removal of selected portions of existing membrane roofing system, and inspection and repair, if needed, of deck, fill in the tear-off areas to match existing membrane roofing system construction.
 - 1. Installation of infill materials is specified in Division 07 Section as indicated in Part 2.
 - 2. Install new roofing membrane patch over roof infill area. If new roofing membrane is installed the same day tear-off is made, roofing membrane patch is not required.

3.5 TEMPORARY ROOFING MEMBRANE

- A. Install approved temporary roofing membrane over area to be reroofed.
- B. Remove temporary roofing membrane before installing new roofing membrane.

3.6 EXISTING BASE FLASHINGS

- A. Remove existing base flashings around parapets, curbs, walls, and penetrations.
 - 1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings specified in Section 076200 - SHEET METAL FLASHING AND TRIM.

3.7 FASTENER PULL-OUT TESTING

- A. Retain independent testing and inspecting agency to conduct fastener pull-out tests according to SPRI FX-1, and submit test report to Owner, Architect, and roofing membrane manufacturer before installing new membrane roofing system.
 - 1. Obtain Owner, Architect, and roofing membrane manufacturer's approval to proceed with specified fastening pattern. Roofing membrane manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

3.8 RECOVER BOARD INSTALLATION

- A. Install recover boards over [roof insulation] [roofing membrane] with long joints in continuous straight lines and end joints staggered between rows. Loosely butt recover boards together and fasten to deck.
 - 1. Tape joints of recover boards if required by roofing membrane manufacturer.
 - 2. Fasten recover boards to resist wind-uplift pressure at corners, perimeter, and field of roof specified in Division 07 Section as indicated in Part 2.
 - 3. Install additional fasteners near board corners and edges as necessary to conform boards to substrate and to adjacent boards.

3.9 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION

SECTION 075400

THERMOPLASTIC MEMBRANE ROOFING

(Part of Work of Section 070002 - ROOFING AND FLASHING, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Adhered membrane-roofing system.
 2. Cover board over insulation.
 3. Roof insulation.
 4. Vapor retarder.
 5. Membrane clad metal flashing.
 6. Flashing for equipment mounted on roofing and roofing penetrations.
- B. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
1. Section 220001 - PLUMBING:
 - a. Roof drains.
 2. Section 230001 - HEATING, VENTILATING, AND AIR CONDITIONING:
 - a. Roof curbs for HVAC equipment.
- C. Items To Be Furnished Only: Not Applicable.
- D. Related Work: The following items are not included in this Section and are specified under the designated Sections:
1. Section 061000 - ROUGH CARPENTRY for wood nailers, curbs, and blocking.
 2. Section 076200 - SHEET METAL FLASHING AND TRIM for metal roof penetration flashings, flashings, and counterflashings.
 3. Section 079200 - JOINT SEALANTS for sealants.
 4. Division 22 - PLUMBING for roof drains.
 5. Division 23 - HEATING, VENTILATING, AND AIR CONDITIONING for roof curbs for HVAC equipment.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

- A. General: 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.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience. PVC membrane shall be separated by specified cover board from extruded polystyrene insulation.
- C. Roofing System Design: Roofing system shall be designed to withstand loads indicated on Drawings, but not less than loads required by Code.
- D. Flashings: Provide base flashings, perimeter flashings, detail flashings and component materials that comply with requirements and recommendations in FMG 1-49 Loss Prevention Data Sheet for Perimeter Flashings; FMG 1-29 Loss Prevention Data Sheet for Above Deck Roof Components; NRCA Roofing and Waterproofing Manual (Fourth Edition) for Construction Details and SMACNA Architectural Sheet Metal Manual (Fifth Edition) for Construction Details, as applicable.
- E. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each roofing system and level. Include plans, elevations, sections, details, and attachments to other Work. Include manufacturer's reviewed and approved details that are project-specific and include dimensions, scaled layouts, assembly profiles, and similar items. Manufacturer generic details will not be accepted. At a minimum, include the following:
 - 1. Base flashings and membrane terminations.
 - 2. Transitions to air barrier membrane.
 - 3. Tapered insulation, including slopes.
 - 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations and note zone dimensions on shop drawing plans.
 - 5. Requirements for meeting specified uplift requirements.
 - 6. Tapered insulation layout, including amount and direction of slopes and drain sumps.
 - 7. Walkway pad plan and detail, as required.
 - 8. Proposed temporary, watertight, tie-off details for each substrate type.
- C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

- D. Qualification Data: For Installer and manufacturer stating that the roof installer is authorized to install the specified system
- E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of complying with performance requirements.
- F. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- G. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.
- H. Maintenance Data: For roofing system to include in maintenance manuals.
- I. Sample Warranties: For manufacturer's special warranties.
- J. Closeout Submittals: Following completion of Work, submit roofing system manufacturer's inspection report of completed roofing installation and completed warranty; submit Installer's completed warranty.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.
- B. Manufacturer Qualifications: A qualified manufacturer shall have minimum of ten years of experience in manufacturing of specified membrane.
- C. Installer Qualifications: A qualified firm with at least five years project experience and at least three projects with size and complexity similar to the Project, that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- D. Roofing Inspector: Owner may engage a full-time roofing inspector during installation of the deck, insulation assembly, membrane, flashing and other appurtenances, and when a survey of the roof and roof drains is conducted. Cooperate with Owner's roofing inspector and allow unlimited access to roofing during construction.
- E. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 01. Review methods and procedures related to roofing system including, but not limited to, the following:
 - 1. Meet with the Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 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. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. Roofing Contractor's Warranty: The roofing subcontractor shall supply Owner with a minimum two-year workmanship warranty for each roof. In the event any work related to the roofing, flashing, or metalwork is found to be defective within two years of substantial completion, the roofing contractor shall remove and replace such at no additional cost to the Owner. The roofing subcontractor's warranty obligation shall run directly to the Owner, and a copy the roofing signed warranty shall be sent to the roofing system's manufacturer.
 1. The duration of the Roofing Contractor's two-year warranty shall run concurrent with the roofing system's manufacturer's 30-year warranty.
- B. Roofing Systems Manufacturer's Warranty: The roofing manufacturer shall guarantee roof areas to be in a watertight condition, for a period of 30 years, from the date of final acceptance of the roofing system. The warranty shall be a 30-year no dollar limit (NDL), non-prorated total system labor and material warranty, for wind speed as required by Code or as indicated on the

Drawings. Total system warranty shall include all roofing materials, related components and accessories including, but not limited to the substrate board, vapor retarder, insulation board, cover board, roofing membrane, membrane flashings, fasteners, adhesives, metal roof copings, metal roof edges and termination metals and roof drain assemblies. The manufacturer shall repair defects in materials and workmanship as promptly after observation as weather and site conditions permit.

PART 2 - PRODUCTS

2.1 PVC ROOFING MEMBRANE

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Carlisle SynTec Systems; Sure-Flex PVC.
 2. Duro-Last Roofing, Inc.
 3. Flex Roofing Systems
 4. GAF Materials Corporation.
 5. Johns Manville.
 6. Sika Sarnafil Inc.
 7. Versico Roofing Systems; Versiflex PVC Membrane.
- B. PVC Sheet: ASTM D 4434, Type III, fabric reinforced.
1. Thickness: 80 mils (1.5 mm), nominal.
 2. Exposed Face Color: White.

2.2 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Single-Ply Roof Membrane Adhesives: 250 g/L.
 - f. Single-Ply Roof Membrane Sealants: 450 g/L.
 - g. Nonmembrane Roof Sealants: 300 g/L.
 - h. Sealant Primers for Nonporous Substrates: 250 g/L.
 - i. Sealant Primers for Porous Substrates: 775 g/L.
 - j. Other Adhesives and Sealants: 250 g/L.
 3. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as sheet membrane.
- C. PVC-Clad Metal Roof Flashing: Heat-weldable flashing designed to serve as gravel stop and fascia at perimeter of thermoplastic membrane roofing.
 - 1. Composition: 25 gauge steel with G90 galvanized coating, with 20 mil (1 mm) PVC membrane laminated to the outside face. Provide unsupported width of membrane along edge to be welded to roofing membrane.
 - 2. Profile: As shown on Drawings.
 - 3. Product: Sarnafil, Inc., Sarnaclad, or equal product approved by manufacturer of roofing system.
 - 4. Exposed Face Color: As selected by Architect from manufacturer's full range.
- D. Bonding Adhesive: Manufacturer's recommended bonding adhesive.
- E. Metal Termination Bars: Manufacturer's standard predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.3 VAPOR RETARDER

- A. Self-Adhering Sheet Vapor Retarder: ASTM D 1970, minimum 40-mil- thick film laminated to layer of rubberized asphalt adhesive; maximum permeance rating of 0.1 perm; cold-applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

2.4 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
 - 1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Roofing Corporation.
 - b. Carlisle SynTec Incorporated.
 - c. Firestone Building Products Company.
 - d. GAF Materials Corp.
 - e. GenFlex Roofing Systems.
 - f. Johns Manville International Inc.

2. Compressive Strength at Terraces: In accordance with ASCE 7-05, "Minimum Design Load for Building and other Structures", pedestrian terraces are required to support a minimum live load of 100 psf. Use 40 psi insulation for when pavers are on pedestals and exclusive of planters and other heavy concentrated loads such as heavy wheel traffic.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.
 1. Cover Board Adhesive: Manufacturer's cold fluid-applied adhesive formulated to adhere cover board to insulation substrate.
- D. Cover Board: Provide the following, as required by roofing manufacturer to comply with performance requirements and provide specified warranty.
 1. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 or 5/8 inch thick, factory primed.

2.6 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured vinyl walkway pads or rolls approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Section 053100 - STEEL DECKING.

4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
7. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 VAPOR-RETARDER INSTALLATION

- A. Self-Adhering Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering sheet vapor retarder over area to receive vapor retarder, side, and end lapping each sheet a minimum of 3-1/2 inches and 6 inches, respectively. Seal laps by rolling.
- B. Completely seal vapor retarder at side laps, end laps, terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.4 INSULATION AND COVERBOARD INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install one or more layers of insulation under area of roofing to achieve required thickness. Install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

- G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. For insulation applied in multiple layers, loose-lay first layer and mechanically fasten top layer.
- H. Mechanically Fastened Cover Boards: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and mechanically fasten to roof deck.
 - 1. Mechanically fasten cover boards, unless otherwise indicated.
 - 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

3.5 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.
- E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.6 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean splice areas, apply splicing cement (except for heat-welded application), and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- E. Terminate and seal top of sheet flashings.

3.7 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
- B. Manufacturer's Technical Representative: Engage a qualified manufacturer's technical representative to perform roof tests and inspections and to prepare test reports.
- C. Contractor shall engage a qualified testing agency to perform the following test:
 - 1. Infrared Thermography: Testing agency shall survey entire roof area using infrared color thermography according to ASTM C1153.
 - a. Perform tests prior to demolition and Substantial Completion.
 - b. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing or nuclear hydrogen detection tests.
 - c. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
 - 1) Cost of retesting is Contractor's responsibility.
 - 2. Testing agency shall prepare survey report of initial scan indicating locations of entrapped moisture, if any.
- D. Final Roof Inspection: Engage roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect and the Owner 48 hours in advance of date and time of inspection.

- E. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

- A. Protect membrane-roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and the Owner.
- B. Correct deficiencies in or remove membrane-roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane-roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

(Part of Work of Section 070002 - ROOFING AND FLASHING, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Sheet metal flashing and trim for the following applications:

- a. Through-wall flashing.
- b. Formed wall flashing and trim.
- c. Formed low-slope roof flashing and trim.

- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

- 1. Section 061000 - ROUGH CARPENTRY for wood nailers, curbs, and blocking.
- 2. Section 075400 - THERMOPLASTIC MEMBRANE ROOFING for installing sheet metal flashing and trim integral with roofing membrane.
- 3. Section 079200 - JOINT SEALANTS for field-applied sheet metal flashing and trim sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Fabricate and install roof edge flashing and copings capable of resisting Wind Zone forces required by Code according to recommendations in FMG Loss Prevention Data Sheet 1-49.
- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.
- D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.
- E. Interface with Other Systems:
1. Do not proceed with installation of flashing and sheet metal until completion of curb and substrate construction, cants, blocking, reglets and other construction required to receive flashing.
 2. Coordinate flashing with other Work for correct sequencing of items comprising entire membrane or system of roofing or waterproofing and rain drainage.
- 1.4 SUBMITTALS
- A. Product Data: For each type of product indicated.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
1. Identify material, thickness, weight, and finish for each item and location in Project.
 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
 4. Details of expansion-joint covers, including showing direction of expansion and contraction.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Sheet Metal Flashing: 12 inches long. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim: 12 inches long. Include fasteners and other exposed accessories.
 3. Accessories: Full-size Sample.
- 1.5 QUALITY ASSURANCE
- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
1. Meet with the Owner, Architect and Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 2. Review methods and procedures related to sheet metal flashing and trim.

3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005. Thickness as specified in this Section. Temper suitable for forming and structural performance required, but not less than H14, finished as follows:
 1. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.
 2. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, with No. 2D dull, cold-rolled finish. Thickness as specified in this Section.
- C. Zinc-Tin Alloy-Coated Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 temper, of minimum uncoated weight (thickness) indicated; coated on both sides with zinc-tin alloy (50 percent zinc, 50 percent tin).

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Revere Copper Products, Inc.; FreedomGray.

2.2 UNDERLAYMENT MATERIALS

- A. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Self-Adhered Membrane Flashing: Modified bituminous 40-mil-thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil-thick, cross-laminated polyethylene film with release liner backing.
- C. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
 3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- D. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- E. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- F. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Isolation Coating: ASTM D 1187, cold-applied asphalt emulsion, VOC compliant, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and

other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength. Provide 2 in. min. end dams at terminations (riveted and sealed watertight).
 - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 3. Soldered Seams in Stainless Steel: Prefabricated inside and outside corners and 2 in. min. end dams at terminations (riveted and soldered watertight).
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- E. 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 deep, filled with elastomeric sealant concealed within joints.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Furnish with 6-inch-wide joint cover plates.
 - 1. Joint Style: Butt, with 12-inch-wide concealed backup plate.
 - 2. Fabricate from the following material:
 - a. Aluminum: 0.050 inch (1.27 mm) thick.
- B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.
 - 1. Joint Style: Butt, with 12-inch-wide concealed backup plate.
 - 2. Fabricate copings from the following material:
 - a. Aluminum: 0.050 inch (1.27 mm) thick.

- C. Roof and Roof to Wall Transition Expansion-Joint Cover: Fabricate from the following material:
 - 1. Stainless Steel: 0.025 inch (0.64 mm) thick.
- D. Base Flashing: Fabricate from the following material:
 - 1. Stainless Steel: 0.019 inch (0.48 mm) thick.
- E. Counterflashing: Fabricate from the following material:
 - 1. Stainless Steel: 0.019 inch (0.48 mm) thick.
- F. Roof-Penetration Flashing: Fabricate from the following material:
 - 1. Stainless Steel: 0.019 inch (0.48 mm) thick.
- G. Roof-Drain Flashing: Fabricate from the following material:
 - 1. Stainless Steel: 0.016 inch (0.40 mm) thick.
- H. Splash Pans: Fabricate from the following material:
 - 1. Stainless Steel: 0.025 inch thick.

2.6 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing, Typical: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12 foot long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch-high end dams. Fabricate from the following material:
 - 1. Zinc-Tin Alloy Coated Copper: 16 oz./sq. ft. (0.55 mm) thick.

2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system. Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer installation instructions, and SMACNA "Architectural Sheet Metal Manual". Anchor units work of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams that will be permanently watertight and weatherproof.
 - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
 - 1. Coat side of stainless-steel sheet metal flashing and trim with isolation coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip-sheet or install a course of polyethylene underlayment.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not

be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
 - 1. Aluminum: Use aluminum or stainless steel fasteners.
 - 2. Stainless Steel: Use stainless-steel fasteners.
- H. Seal joints with elastomeric sealant as required for watertight construction.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.
- I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Prein edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.
 - 1. Do not solder aluminum sheet.
 - 2. Stainless-Steel Soldering: Prein edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
 - 3. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.
- J. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions,] and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.
 - 1. Secure in a waterproof manner by means of snap-in installation and sealant.

- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
 - 1. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for flashing on vent piping.

3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 077100

ROOF SPECIALTIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Roof-edge drainage systems.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 061000 - ROUGH CARPENTRY for wood nailers, curbs, and blocking.
 - 2. Section 079200 - JOINT SEALANTS for sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
 - 1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.

3. Details of termination points and assemblies, including fixed points.
4. Details of special conditions.

- C. Samples for Verification: For roof-edge drainage systems made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical roof edge, including gutter and downspout approximately 10 feet long, including supporting construction, seams, attachments, and accessories.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- B. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

- A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005. Thickness as specified in this Section. Temper suitable for forming and structural performance required, but not less than H14, finished as follows:

1. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Fluoropolymer 3-Coat System: Manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat

containing not less than 70 percent polyvinylidene fluoride resin by weight, with a minimum total dry film thickness of 1.5 mil; complying with AAMA 2605.

- 1) Color: As selected by Architect from manufacturer's full range.

2.2 CONCEALED METALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 2. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
 3. Fasteners for Zinc-Coated Copper Sheet: Series 300 stainless steel.
- C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

2.4 ROOF-EDGE DRAINAGE SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ATAS International, Inc.
 2. Berger Building Products, Inc.
 3. Cheney Flashing Company.
 4. Hickman Company, W. P.
 5. Merchant & Evans, Inc.
 6. Metal-Era, Inc.
 7. Metal-Fab Manufacturing, LLC.
 8. MM Systems Corporation.
- B. Scuppers and Splash Blocks: Configuration as indicated on Drawings.
 1. Fabricate from the following exposed metal:
 - a. Aluminum: Minimum 0.040 inch (1.02 mm) thick.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a stripable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F

- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches except reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.3 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Scuppers: Anchor securely to wall as indicated on Drawings.

3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 077200

ROOF ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Non-penetrating roof edge protection systems.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 055000 - METAL FABRICATIONS for ships' ladders.
 - 2. Section 055150 - METAL RAILINGS for other railing systems.
 - 3. Section 061000 - ROUGH CARPENTRY for wood cants and wood nailers

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and Code required loads and stresses within limits and under conditions indicated:
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. Product Data: For metal railings and the following:
 - 1. Paint products, including printed statement of VOC content.
 - 2. Grout, including printed statement of VOC content.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Delegated-Design Submittal: For stairs and railings indicated to comply with performance requirements and design criteria, including structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- D. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- E. Welding certificates.
- F. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal stairs and railings that are similar to those indicated for this Project in material, design, and extent.
- C. Installer Qualifications: Fabricator of products.
- D. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.7 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails, unless otherwise indicated.
 - 1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn)]
- C. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M[either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial steel, Type B, or structural steel, Grade 33, unless another grade is required by design loads.
- E. Galvanized Malleable Cast Iron: ASTM A447 with ASTM A153 galvanizing.

2.3 FASTENERS

- A. General: Provide stainless steel Type 316 for exterior use. Select fasteners for type, grade, and class required.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Section 099000 - PAINTING AND COATING.
- C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Available Products: Dupont Ganicin, Keeler and Long Urethane Zinc Rich Primer, or Tnemec Series 394 PerimePrime.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 - 1. Provide interior, field-applied paint with a VOC content of 250 g/L or less, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

- A. Provide complete assemblies, including metal framing, railings, clips, brackets, bearing plates, and other components necessary to support railings.
 - 1. Join components by welding, unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously, unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 NON-PENETRATING ROOF EDGE PROTECTION SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Garlock Safety Systems.
 - 2. Kee Safety, Inc.
 - 3. Lynn Safety, Inc.
 - 4. Safety Rail Company.
 - 5. Skyline Group.
 - 6. Tractel Ltd.
- B. Basis of design: Kee Safety, Inc.; KeeGuard Roof Edge Protection System.
- C. Roof Edge Protection: Provide freestanding system, including pipe railings, uprights, bases, counterweights and fittings.
 - 1. Freestanding counterweighted guardrail system with 42 inch minimum height to provide a pedestrian egress barrier on the roof to withstand a minimum load of 200 pounds in any direction to the top rail per OSHA Regulation 29 CFR 1910.23.
 - 2. Pipe: Steel, 1-1/2 inches schedule 40, galvanized.
 - 3. Tube: Galvanized tube, minimum 12 gauge, 1-1/2 inches, 1.90 inches OD.
 - 4. Rails and Posts: Galvanized Tube, minimum 12 gauge, 1-1/2 inches 1.90 inches diameter.
 - 5. Fittings: Cast iron.
 - 6. Counterweight Levers: Galvanized Tube, minimum 12 gauge, 1-1/4 inches 1.66 inches diameter.

7. Mounting Bases: Steel bases are galvanized and are supplied with a rubber pad on underside of the component.
8. Counterweights: Molded recycled PVC with one fixing collar per counterbalance.
9. Fasteners: Stainless steel or galvanized.
10. Finish: Polyester factory applied spray coating.

2.7 STEEL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal railings after assembly.
- C. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:
 1. Interior Railings (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- E. Apply shop primer to uncoated surfaces of metal railing components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
 2. Verify dimensions of roof openings for roof accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof accessories with isolation coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip-sheet, or install a course of polyethylene underlayment.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

3.3 TOUCH UP

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- C. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 078410

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 079200 - JOINT SEALANTS for standard joint sealers.
 - 2. Division 21 - FIRE SUPPRESSION for fire-protection piping penetrations.
 - 3. Division 22 - PLUMBING for piping penetrations.
 - 4. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING for duct and piping penetrations.
 - 5. Division 26 - ELECTRICAL for cable and conduit penetrations.

1.3 COORDINATION

- A. Jobsite conditions of each through-penetration firestop system must meet all details of the UL-Classified System selected. If jobsite conditions do not match any UL-classified systems, contact firestop manufacturer for alternative systems or Engineer Judgment Drawings.
- B. Coordinate work with other trades to assure that penetration-opening sizes are appropriate for penetrant locations.
- C. Verify that the schedule is current at the time of construction, and that each referenced system is suitable for the intended application.

1.4 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
 - C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
 - 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
 - E. Exposed Penetration Firestopping:
 - 1. Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
 - 2. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - a. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems demonstrating no evidence of water leakage when tested according to UL 1479.
 - b. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - F. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- 1.5 SUBMITTALS
- A. Product Data: For each type of product indicated.
 - B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
1. Types of penetrating items.
 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- D. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Either a firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" or a firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction of a minimum of five projects with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed in the UL "Fire Resistance Directory."
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to the following:
 - 1. Hilti, Inc.
 - 2. BioFireshield; RectorSeal Corporation.
 - 3. Specified Technologies, Inc. (STI).
 - 4. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING MATERIALS

- A. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- B. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
 - 4. Methylene chloride and perchloroethylene may not be intentionally added to sealants.
- C. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- D. Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies indicated in the approved Through-Penetration Firestop System Schedule submittal. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
 - 1. Basis of Design:
 - a. BioFireShield; RectorSeal Smoke and Acoustic Sealant.
 - b. Hilti; CP 606 Flexible Firestop Sealant.
 - c. Hilti; CP 653 BA Firestop Speed Sleeve.
 - d. Hilti; FS-ONE Intumescent Firestop Sealant.
- E. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
- F. Endothermic Mats: 3M Interam Endothermic Mats by 3M Fire Protection Products; located in rated walls behind cabinet unit heaters, fire extinguisher cabinets and electrical panels where there are space limitations to maintain the wall rating.

2.3 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports, as required by 2015 IBC 1705.17 and 1705.17.1. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 079200

JOINT SEALANTS

(PART OF WORK OF SECTION 070001 - Waterproofing, Dampproofing and Caulking, FILED SUB-BID
REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Joint sealants and fillers.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- D. Qualification Data: For Installer and qualified testing agency.
- E. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

- F. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- H. Field Test Report Log: For each elastomeric sealant application.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- D. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - a. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - b. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with joint sealant backing and glazing and gasket materials.
 - 2. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 4. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.

- b. Each type of nonelastomeric sealant and joint substrate indicated.
- 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 4. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 - 5. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. **Low-Emitting Materials:** Interior sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. **VOC Content:** Provide interior sealants and sealant primers that comply with the following limits for VOC content:
 1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
 4. Methylene chloride and perchloroethylene may not be intentionally added to sealants.
- D. **Colors of Exposed Joint Sealants:** Provide colors as selected by the Architect from manufacturer's full range of standard and custom colors; maximum of five colors, three standard colors and two custom colors.

2.2 JOINT SEALANTS

- A. **Elastomeric Sealants:** Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. **Stain-Test-Response Characteristics:** Elastomeric sealants shall be nonstaining to porous substrates. Provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. **Suitability for Contact with Food:** Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600 or ANSI/NSF Standard 51.
- D. **Exterior Silicone Sealant, Single-Component Neutral-Curing Type:**
 1. **Available Products:** Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Silicones; SilPruf LM SCS2700.

- c. Pecora Corporation; 864.
 - d. Tremco Inc.; Spectrem 1.
 - 2. Extent of Use: Exterior joints in vertical and soffit surfaces.
 - E. Exterior Urethane Sealant, Multicomponent Pourable (Self-Leveling) Type for Pedestrian Traffic: ASTM C 920, Type M, Grade P, Class 25, Use T, M, & O.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Meadows, W. R., Inc.; POURTHANE.
 - b. Pecora Corporation; Urexpan NR-200.
 - c. Sika; Sikaflex-2c SL.
 - d. Tremco Inc.; THC-901.
 - 2. Extent of Use: Exterior joints in horizontal surfaces.
 - F. Interior Acrylic Latex Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Henkel Corp.; Loctite Polyseamseal Acrylic Caulk with Silicone.
 - b. Pecora Corporation; AC-20+.
 - c. Tremco Inc.; Tremflex 834.
 - 2. Extent of Use: Interior non-moving joints.
- 2.3 JOINT-SEALANT BACKING
- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin) or other type, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Basis of Design: Armacell Canada Inc.; ITP Standard Backer Rod.
 - C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- 2.4 MISCELLANEOUS MATERIALS
- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include concrete, masonry, unglazed surfaces of ceramic tile, and exterior insulation and finish systems.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following metal, glass, porcelain enamel, and glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 079201

EXTERIOR JOINT SEALANTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Contract Documents:

1. Work requirements are contained in Contract Documents and include cross-references to published information, which are not necessarily bound as part of this Project Manual.
2. Drawings and General Provision of the Contract, including General and Supplementary Conditions, and other Division 1 Specification Sections, apply to work and all Specification Sections of this Project.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, sealing and caulking of joints as indicated on the Drawings and as specified, including but not limited to the following

1. Sealing of joints in exterior concrete and masonry construction.
2. All other exterior sealing called for, or reasonably inferred from the Drawings, and as required to provide weather tight conditions in exterior assemblies.

B. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council. Refer to Section 018110, SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 033001, CAST-IN-PLACE CONCRETE - SITEWORK.
2. Section 321313, PORTLAND CEMENT CONCRETE PAVING.

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Association of State Highway and Transportation Officials (AASHTO):
M 220 Preformed Elastomeric Compression Joint Seals for Concrete
2. American Society for Testing and Materials (ASTM):
C 719 Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement
C 790 Use of Latex Sealing Compounds
C 834 Latex Sealing Compounds

EXTERIOR JOINT SEALANTS

C 920	Elastomeric Joint Sealants
C 962	Use of Elastomeric Joint Sealants
C 1330	Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants
D 412	Test Methods for Rubber Properties in Tension
D 624	Test Method for Rubber Property - Tear Resistance
D 2628	Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

3. Federal Specifications (Fed. Spec.):

TT-S-00227	Sealing Compound: Elastomeric Type, Multi-Component (For Calking, Sealing, and Glazing in Buildings and Other Structures)
TT-S-001543A	Sealing Compound: Silicone Rubber Base (For Calking, Sealing, and Glazing in Buildings and Other Structures)

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each sealant material used. Provide certifications that sealant materials comply with specified requirements.
- B. Initial Selection Samples: Submit samples manufacturer's color charts showing complete range of colors, textures, and finishes available for each material used.
- C. Verification Samples: Submit actual representative samples of each sealant material that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide sealant samples having minimum size of 4 in. long.
- D. Test Reports: Provide certified reports for all specified tests.

1.6 COMPATIBILITY

- A. Provide sealant and sealant joint backing materials suitable for the use intended and compatible with the materials with which they will be in contact. Compatibility of sealant and accessories shall be verified by the sealant manufacturer.

1.7 QUALITY ASSURANCE

- A. Source: For each sealant material type required for the work of this section, provide primary materials which are the product of one manufacturer. Provide secondary or accessory materials which are acceptable to the manufacturers of the primary materials.
- B. Installer: A firm with a minimum of five years experience in type of work required by this Section and which is acceptable to the manufacturers of the primary materials.
- C. Mock-Ups: Prior to commencing the primary work of this Section, provide mock-ups at locations acceptable to Architect. Obtain Architect's acceptance of visual qualities. Protect and maintain accepted mock-ups throughout the remainder of the work of this section to serve as criteria for acceptance of the work.

1.8 PROJECT CONDITIONS

- A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within the limits established by manufacturers of the materials and products used.

- B. Substrates: Proceed with work only when substrate construction and penetration work is complete.

1.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Materials under this Section shall be delivered to, and stored at, the job site in unbroken factory sealed containers with labels intact

1.10 WARRANTY

- A. Furnish joint sealant manufacturer's written single-source performance warranty that joint sealant work will be free of defects related to workmanship or material deficiency for five years from date of Substantial Completion of the Project.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Before installation check each sealant for compatibility with adjacent materials and surfaces and with indicated exposures. Select sealers which are recommended by manufacturer for each application indicated. Where exposed to pedestrian or vehicular traffic, provide sealants which are non-tracking and are strong enough to withstand the traffic without damage.
- B. Provide colors as selected by Architect from manufacturer's standard and special (Tremco Fastpak) colors. Where specifically requested, provide custom color matches.

2.2 NON-SAG POLYURETHANE SEALANT

- A. Provide multi-part, non-sag, polyurethane based elastomeric sealant, complying with ASTM C 920 Type M, Grade NS, Class 25, Fed. Spec. TT-S-00227E Class A, having Shore A hardness of 20 to 30, cured modulus of elasticity at 100% elongation of not more than 75 psi, and tear resistance of not less than 50 lbs./inch when tested according to ASTM D 624.
- B. Provide one of the following products that meet or exceed specified requirements:
 - 1. Mameco International Vulkem 227
 - 2. Harry S. Peterson Co. Iso-Flex 2000
 - 3. Sika Sikaflex 2c NS.
 - 4. Sonneborn Sonolastic NP 2
 - 5. Tremco Dymeric.
- C. Where joint requires 50% movement capabilities, provide Tremco Dymeric Plus, or equal product approved by Architect.
- D. Extent: Provide non-sag polyurethane sealant for all paving joints, masonry to masonry joints, and other joints not indicated to be sealed with another type of sealant.

2.3 PREFORMED JOINT SEALER

- A. Preformed Resilient Joint Sealer: Preformed Resilient Joint Sealer for use at expansion joints in exterior concrete walls where specifically called for on Drawings shall be preformed, resilient, extruded polychlorophrene elastomeric joint sealer, conforming to ASTM D 2628 and AASHTO M 220 of indicated configuration(s), in continuous lengths, set in manufacturer's recommended primer-lubricating-adhesive consisting of moisture curing polyurethane and aromatic

hydrocarbon solvent mixture (73% solid by weight) concrete gray color, equal to one of the following:

1. D.S. Brown Co.
2. Watson-Bowman & Acme Corp.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Provide primer recommended by sealant manufacturer for surfaces to be adhered to.
- B. Bond Breaker Tape: Provide polyethylene or other plastic tape recommended by sealant manufacturer to prevent three-sided adhesion.
- C. Backer Rod: Provide closed cell compressible rod of durable nonabsorptive material recommended by sealant manufacturer for compatibility with sealant, conforming to ASTM C 1330. Provide products of one of the following manufacturers:
 1. Backer Rod Manufacturing and Supply Co.
 2. Dow Chemical Co.
 3. W. R. Meadows, Inc.
 4. Williams Products, Inc.
 5. Woodmont Products, Inc..
- D. Joint backing for general use at joints in horizontal surfaces shall consist of two rows of butyl rubber or neoprene foam rod in contact with one another, and each compressed to approximately 2/3 original width when in place.
- E. Provide miscellaneous materials of type that will not bleed through sealant, discolor surface, or produce other deleterious effects. Select size to provide compression to approximately 2/3 original width when in place. Provide backing material profile concave to the rear of the sealant, and equipped with a bond-breaking film.

PART 3 - EXECUTION

3.1 INSPECTION

- A. The Installer shall examine substrates and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning of sealant work means Installer's acceptance of joint surfaces and conditions.

3.2 PREPARATION

- A. Strictly comply with manufacturers' instructions and recommendations, except where more restrictive requirements are specified in this Section.
- B. Clean joint surfaces immediately before installation of sealants, primers, tapes and fillers. Remove substances which could interfere with bond. Etch or roughen joint surfaces to improve bond. Surfaces which have been given protective coatings and those that contain oil or grease shall be thoroughly cleaned with xylol or MEK solvent, with due precautions taken to minimize hazards.
- C. Unless otherwise indicated, use of sealants shall conform to the following: ASTM C 790 for latex sealants and ASTM C 962 for other sealants.

- D. Tape or mask adjoining surfaces to prevent spillage and migration problems.
- E. Prime surfaces as recommended by sealant manufacturer.

3.3 INSTALLATION

- A. Schedule work as long as possible after completion of concrete work and finished brick paving and granite work.
- B. Provide backer rods for liquid sealants except where specifically recommended against by sealant manufacturers.
- C. Prevent three sided adhesion by use of bond breaker tapes or backer rods.
- D. Force sealant into joints to provide uniform, dense, continuous ribbons free from gaps and air pockets. Completely wet both joint surfaces equally on opposite sides.
- E. Except in hot weather, make sealant surface slightly concave. Install sealants so that compressed sealants do not protrude from joints. Dry tool sealants to form a smooth dense surface. At horizontal joints form a slight cove to prevent trapping water.
- F. Provide sealants to depths indicated, or if not indicated, follow manufacturer's recommendations. For joints up to 3/8 in. width, depth of joint shall not exceed 1/2 in.; for joints larger than 1/2 in. width, depth of joint shall not exceed 5/8 in.

3.4 EXTENT OF SEALANT WORK

- A. General Extent: Seal joints indicated, and all exterior joints, seams, and intersections between dissimilar materials. Provide elastomeric sealant installation with backer rod in all exterior control joints.
- B. Exterior Sealing: Without limitation, the work of this Section includes sealing the following:
 - 1. Masonry to masonry joints.
 - 2. Masonry to other exterior materials, including concrete and metal.
 - 3. Concrete to concrete joints.
 - 4. Joints and cracks in paving and walks.
 - 5. Joint fillers for all joints.

3.5 CURING

- A. Cure sealants in strict compliance with manufacturers' instructions and recommendations to obtain highest quality surface and maximum adhesion. Make every effort to minimize accelerated aging effects and increase in modulus of elasticity.

3.6 CLEANING AND PROTECTION

- A. Remove smears from adjacent surfaces immediately, as the work progresses. Exercise particular care to prevent smearing or staining of surrounding surfaces which will be exposed in the finished work, and repair any damage done to same as result of this work without additional cost to Owner.
- B. Remove and replace work that is damaged or deteriorated.

- C. Clean adjacent surfaces using materials and methods recommended by sealant manufacturer. Remove and replace work that cannot be successfully cleaned.

- D. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protection immediately before final acceptance

END OF SECTION

SECTION 079500

EXPANSION CONTROL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Architectural expansion joint systems for interior and exterior joints as scheduled on the Drawings and specified in this Section.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 033000 - CAST-IN-PLACE CONCRETE for block-outs for architectural joint systems in concrete floors, decks, and walls.
 - 2. Section 079200 - JOINT SEALANTS for elastomeric sealants and preformed compressed-foam sealants without metal frames.

1.3 DEFINITIONS

- A. Architectural Joint System: Any filler or cover used to span, fill, cover, or seal a joint, except expanding foam seals and poured or foamed in-place sealants.
- B. Cyclic Movement: Periodic change between widest and narrowest joint widths in an automatically mechanically controlled system.
- C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist passage of flame and hot gases through a movement joint.
- D. Maximum Joint Width: Widest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.
- E. Minimum Joint Width: Narrowest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.
- F. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage of nominal value of joint width.

- G. Nominal Joint Width: Width of linear gap indicated as representing the conditions existing when architectural joint systems will be installed or, if no nominal joint width is indicated, a width equal to the sum of maximum and minimum joint widths divided by two.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide factory-fabricated architectural joint systems capable of withstanding the types of loads and of accommodating the kinds of movement, and the other functions for which they are designed including those specified below, without failure. Types of failure include those listed in Appendix X3 of ASTM E 1399.
1. Vehicular Traffic Joints: Support vehicular traffic across joint, including construction equipment and full-loaded fire apparatus.
 2. Pedestrian Traffic Joints: Support pedestrian traffic across joint.
 3. Exterior Joints: Maintain continuity of weather enclosure.
 4. Joints in Fire-Resistance-Rated Assemblies: Maintain fire-resistance ratings of assemblies.
 5. Joints in Smoke Barriers: Maintain integrity of smoke barrier.
 6. Joints in Acoustically Rated Assemblies: Inhibit passage of airborne noise.
 7. Other Joints: Where indicated, provide joint systems that prevent penetration of water, moisture, and other substances deleterious to building components or content.
 8. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - a. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 - b. Component Importance Factor is 1.5.
 9. Joints in Surfaces with Architectural Finishes: Serve as finished architectural joint closures.

1.5 SUBMITTALS

- A. Product Data: Include manufacturer's product specifications, construction details, material and finish descriptions, and dimensions of individual components and seals.
- B. Shop Drawings: For each joint system specified, provide the following:
1. Placement Drawings: Include line diagrams showing entire route of each joint system, plans, elevations, sections, details, joints, splices, locations of joints and splices, and attachments to other Work. Where joint systems change planes, provide Isometric Drawings depicting how components interconnect to achieve continuity of joint covers and fillers.
- C. Samples for Verification: Full-size units 6 inches long of each type of joint system indicated; in sets for each finish, color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
- D. Product Test Reports: From a qualified testing agency indicating architectural joint systems comply with requirements, based on comprehensive testing of current products.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain architectural joint systems through one source from a single manufacturer. Coordinate compatibility with adjoining joint systems specified in other Sections.
- B. Fire-Test-Response Characteristics: Where indicated, provide joint systems incorporating fire barriers that are identical to those of assemblies tested for fire resistance per UL 2079 or ASTM E 1966, including hose-stream test of vertical wall assemblies and wall-to-ceiling assemblies, by a testing and inspecting agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Balco, Inc.
 - 2. Construction Specialties, Inc.
 - 3. JointMaster/InPro Corporation.
 - 4. Michael Rizza Company, LLC.
 - 5. MM Systems Corporation.
 - 6. Nystrom, Inc.
 - 7. Watson Bowman Acme Corp.; a BASF Construction Chemicals business.

2.2 MATERIALS

- A. Aluminum: ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Stainless Steel: ASTM A 666, Type 304 with No. 2B finish, unless otherwise indicated, for plates, sheet, and strips.
- C. Preformed Seals: Single or multicellular extruded elastomeric seals designed with or without continuous, longitudinal, internal baffles. Formed to be installed in frames or with anchored flanges, in color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.
- D. Strip Seals: Elastomeric membrane or tubular extrusions with a continuous longitudinal internal baffle system throughout complying with ASTM E 1783; used with compatible frames, flanges, and molded-rubber anchor blocks.
- E. Compression Seals: Preformed, elastomeric extrusions having internal baffle system complying with ASTM E 1612 in sizes and profiles indicated or as recommended by manufacturer.
- F. Preformed Cellular Foams: Nonextruded, low-density, crosslinked, nitrogen-blown ethylene-vinyl-acetate copolymer extruded, compressible foam.

- G. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint.
- H. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 ARCHITECTURAL JOINT SYSTEMS

- A. General: Provide joint systems of design, basic profile, materials, and operation indicated. Provide units with the capability to accommodate joint widths indicated and variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials.
 - 2. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
 - 3. Frames for Strip Seals: Designed with semiclosed cavity that provides a mechanical lock for seals of type indicated.
 - 4. Public Area Seals: Non-slip seals designed for installation on treads and risers and to lie flat with adjacent surfaces, and complying with ADA guidelines for public areas.

2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.5 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

2.6 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Bright, Directional Polish: No. 4 finish.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to architectural joint system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, Placement Drawings, and instructions for installing joint systems to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.
- C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.
- D. Provide the services of a surveyor licensed in the state the project is located prior to and after paving substrate to confirm alignment of joint.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for handling and installing architectural joint assemblies and materials, unless more stringent requirements are indicated.
- B. Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
- C. Terminate exposed ends of exterior architectural joint assemblies with factory-fabricated termination devices to maintain waterproof system.
- D. Install factory-fabricated transitions between building expansion-joint cover assemblies and roof expansion-joint assemblies to provide continuous, uninterrupted, watertight construction.
- E. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required to install joint systems.
 - 1. Install joint cover assemblies in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 2. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.
 - 3. Set covers in horizontal surfaces at elevations that place exposed surfaces flush with adjoining finishes.
 - 4. Locate covers in continuous contact with adjacent surfaces.
 - 5. Securely attach in place with required accessories.
 - 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- F. Continuity: Maintain continuity of joint systems with a minimum number of end joints and align metal members. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials, if any, to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

- G. Extruded Preformed Seals: Install seals to comply with manufacturer's written instructions and with minimum number of end joints.
 - 1. For straight sections, provide preformed seals in continuous lengths.
 - 2. Vulcanize or heat-weld field splice joints in preformed seal material to provide watertight joints using procedures recommended by manufacturer.
 - 3. Apply adhesive, epoxy, or lubricant adhesive approved by manufacturer to both frame interfaces before installing preformed seals.
 - 4. Seal transitions according to manufacturer's written instructions.
 - 5. Install foam seals with adhesive recommended by manufacturer and heat seal all splices.
- H. Joint Systems with Seals: Seal end joints within continuous runs and joints at transitions according to manufacturer's written instructions to provide a watertight installation.
- I. Seismic Seals: Install interior seals in continuous lengths. Install exterior seal in standard lengths and vulcanize or heat-weld field splice joints to provide watertight joints using manufacturer's recommended procedures. Seal transitions and end joints according to manufacturer's written instructions.
- J. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and end joints.

3.3 CLEANING AND PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

END OF SECTION

SECTION 083110

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Access doors and frames for walls and ceilings.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 033000 - CAST-IN-PLACE CONCRETE for blocking out openings for access doors and frames in concrete.
 - 2. Section 042000 - UNIT MASONRY for anchoring and grouting access door frames set in masonry construction.

1.3 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door and frame through one source from a single manufacturer.

- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 for vertical access doors and frames.
 - 2. ASTM E 119 for horizontal access doors and frames.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Steel Sheet: Electrolytic zinc-coated, ASTM A 879/A 879M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 - 2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
- D. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 STAINLESS-STEEL MATERIALS

- A. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316. Remove tool and die marks and stretch lines or blend into finish.

1. Finish: Directional Satin Finish, No. 4.

2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Acudor Products, Inc.
 2. Babcock-Davis.
 3. Dur-Red Products.
 4. JL Industries (a division of Activar Construction Products Group).
 5. Karp Associates, Inc.
 6. Larsen's Manufacturing Company.
 7. Milcor Inc.
 8. Nystrom, Inc.
- B. Flush Access Doors and Trimless Frames: Fabricated from steel sheet at typical areas and from stainless-steel sheet at toilet and wet areas.
1. Locations: Wall and ceiling surfaces.
 2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
 3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead flange.
 4. Hinges: Continuous piano.
 5. Lock: Cylinder.
- C. Recessed Access Doors and Trimless Frames: Fabricated from steel sheet at typical areas and from stainless-steel sheet at toilet and wet areas.
1. Locations: Wall and ceiling surfaces.
 2. Door: Minimum 0.060-inch-thick sheet metal in the form of a pan recessed 5/8 inch for gypsum board infill.
 3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead for gypsum board surfaces.
 4. Hinges: Concealed pivoting rod hinge.
 5. Lock: Cylinder.
- D. Fire Rated, Uninsulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel at typical areas and from stainless-steel sheet at toilets and wet areas.
1. Locations: Wall surfaces.
 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 3. Door: Minimum 0.060-inch-thick sheet metal, flush construction.
 4. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
 5. Hinges: Continuous piano.
 6. Automatic Closer: Spring type.
 7. Lock: Self-latching device with cylinder lock.
- a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 1. For trimless frames with drywall bead, provide edge trim for gypsum board and gypsum base securely attached to perimeter of frames.
 - 2. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
 - 3. Provide mounting holes in frames for attachment of units to metal or wood framing.
 - 4. Provide mounting holes in frame for attachment of masonry anchors.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
 - 1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder lock, furnish two keys per lock and key all locks alike.
 - 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 090007

PAINTING

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert name of sub-bidder)

MASS. STATE PROJECT: ((Insert project number from top of page))

SUB-BID FOR SECTION: 090007 – PAINTING

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Awarding Authority.
3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Awarding Authority in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

A001	BASEMENT KEY PLAN
A100	BASEMENT LEVEL RCPS - DEMO AND PROPOSED
A102	PARTIAL ROOF PLAN - NORTH
A103	PARTIAL ROOF PLAN - SOUTH
A201	EXTERIOR ELEVATIONS
A202	EXTERIOR ELEVATIONS
A504	GUARDRAIL DETAILS
A510	SIDEWALK SECTIONS - DEMO AND PROPOSED
A511	SIDEWALK SECTIONS - DEMO AND PROPOSED
A512	SIDEWALK SECTIONS

A513 SIDEWALK SECTIONS, ELEVATIONS, AND DETAILS
A901 SCHEDULES AND WALL TYPES

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. All Work of Section 099000 - PAINTING AND COATING
- B. Alternates: Not Applicable.

END OF SECTION

SECTION 092110

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Interior gypsum wallboard.
 2. Acoustic insulation (sound attenuation batts) in gypsum wallboard assemblies.
 3. Non-load-bearing steel framing.
 4. Installation of access panels.
 5. Marking and identification for fire- and smoke-partitions.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
1. Section 061000 - ROUGH CARPENTRY for plywood backing panels.
 2. Section 083110 - ACCESS DOORS AND FRAMES for installation in gypsum board assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide fire stop tracks capable of withstanding deflection within limits and under conditions indicated.
1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.
- B. Marking and Identification for Fire- and Smoke-Partitions: Fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions and other walls required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
 2. Locate within 15 feet of end of each wall and repeat at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
 3. Include lettering not less than 3 inches in height with a minimum 3/8 inch stroke in contrasting color, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," or other wording.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: If materials and systems other than those specified and those indicated on the Drawings are proposed for use, submit shop drawings signed and sealed by a structural engineer licensed in the jurisdiction of the project certifying proposed systems meet code requirements, project requirements and the following deflection criteria:
 - 1. For gypsum board assemblies without applied rigid finishes L/240; for gypsum board assemblies with applied rigid finishes such as tile, stone, wood paneling L/360. Lateral load 5 psf except at shafts. Lateral load at shafts shall be required based on analysis of equipment and systems using shaft.
- C. Samples: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.

- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: Manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, expansion anchor.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges with depth as required for span and loading and indicated on Drawings.
- E. Furring Channels (Furring Members): 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
- F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Furring System.
 - c. USG Corporation; Drywall Suspension System.

2. Performance Requirements: Ceiling support system shall support a live load of 6 psf minimum at L/240.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. California Expanded Metals Co. (CEMCO).
 2. EB Metal U.S.
 3. Marino\WARE.
 4. Studco Building Systems.
- B. Steel Studs and Runners: ASTM C 645.
 1. Minimum Base-Steel (Uncoated) Thickness: 0.0296 inches (20 gage)
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Brady Innovations; Sliptrack Systems.
 - 2) California Expanded Metals Co. (CEMCO); CST Slotted Tracks.
 - 3) Clark Dietrich Building Systems; MaxTrak Slotted Deflection Track.
 - 4) Steel Network Inc. (The); Vertitrack VT Series.
- D. Fire Stop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. California Expanded Metals Co. (CEMCO); FAS-TRK 1000 Slotted Tracks.
 - b. Clark Dietrich Building Systems; BlazeFrame Fire Stop Deflection Track.
 - c. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: 0.0312 inch (20 gauge).

- F. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: 1-1/2 inches.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
 - G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.0312 inch (20 gauge).
 - 2. Depth: 1-1/2 inches.
 - H. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission. Strictly comply with manufacturer's installation instruction.
 - 1. Basis-of-Design: ClarkDietrich RC Deluxe, asymmetrical configuration.
 - I. Resilient Sound Isolation Clips: Provide galvanized steel and resilient material sound-isolation clips, equal to the following:
 - 1. Kinetics Noise Control Co.; IsoMax.
 - 2. PAC International, Inc.; RSIC-1.
 - 3. Pliteq, Inc.; GenieClip.
 - 4. Studco Building Systems; Resilmount A237R.
 - J. Spring Isolation Hangers: Provide galvanized and coated spring hanger system, equal to the following:
 - 1. Kinetics Noise Control Co.; ICW.
 - 2. PAC International, Inc.; RSIC--SI-CRC Pro Series.
 - K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
 - L. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
 - M. Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.
- 2.4 INTERIOR GYPSUM BOARD
- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. CertainTeed Gypsum, Inc.
 - 2. National Gypsum Company.
 - 3. United States Gypsum Company (USG).
 - B. Gypsum Wallboard: ASTM C 1396.
 - 1. Basis of Design: USG; SHEETROCK EcoSmart Panels.

- a. MRc2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Type III EPD.
 - b. EQc2, Low-Emitting Materials, General Emissions Evaluation: GreenGuard Gold certification.
 2. Thickness: 1/2 inch and 5/8 inch as indicated.
 3. Long Edges: Tapered.
 - C. Gypsum Wallboard, Fire-Resistant Type X: ASTM C 1396.
 1. Basis of Design: USG; SHEETROCK EcoSmart Panels Firecode X.
 - a. MRc2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Type III EPD.
 - b. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Health Product Declaration (HPD) or Declare product labels.
 - c. EQc2, Low-Emitting Materials, General Emissions Evaluation: GreenGuard Gold certification.
 2. Thickness: 5/8 inch.
 3. Long Edges: Tapered.
 - D. Abuse-Resistant Type: ASTM C 1629. Manufactured to produce greater resistance to surface indentation and through-penetration (impact resistance) than standard, regular-type and Type X gypsum board.
 1. Core: 5/8 inch, Type X.
 2. Long Edges: Tapered.
 - E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396. With moisture- and mold-resistant core and paper surfaces.
 1. Basis of Design: USG; SHEETROCK EcoSmart Mold Tough Firecode X.
 - a. MRc2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Type III EPD.
 - b. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Declare product labels.
 - c. EQc2, Low-Emitting Materials, General Emissions Evaluation: GreenGuard Gold certification.
 2. Core: 5/8 inch, Type X.
 3. Long Edges: Tapered.
 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- 2.5 TRIM ACCESSORIES
- A. Interior Trim: ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.

- b. Bullnose bead.
- c. LC-Bead: J-shaped; exposed long flange receives joint compound.
- d. Expansion (control) joint.
- e. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
- 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
- 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

- 1. Interior Gypsum Wallboard: Paper.
- 2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

- 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
- 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
- 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
- 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

- 1. Cementitious Backing Units: Thinset, nonsag mortar, as recommended by backing unit manufacturer. Refer to Section 093000 - TILING.
- 2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Basis of Design: Henkel; OSI F38 Drywall and Panel Adhesive.
 2. Low-Emitting Materials: Provide adhesives in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. VOC Content: 50 g/L or less.
 4. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.
 5. Do not use adhesives that contain urea formaldehyde.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious tile backing units, use screws of type and size recommended by panel manufacturer.
- D. Acoustic Insulation, Sound Attenuation (Batts) Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Knauf Insulation; EcoBatt.
 - b. Owens Corning; EcoTouch SAB.
 - c. Owens Corning; Thermafiber SAFB FF.
 - d. Rockwool (formerly Roxul); AFB evo.
 2. MRc2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD).
 3. MRc3, Recycled Content: Use minimum recycled content of 25%.
 4. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Health Product Declaration (HPD) or Declare product labels.
 5. EQc2, Low-Emitting Materials, General Emissions Evaluation: GreenGuard Gold certification.
 6. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, joint sealant, recommended for sealing interior concealed joints to reduce airborne sound transmission.
1. Available Products, for Concealed and Exposed Joints: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - c. USG; SHEETROCK Acoustical Sealant.

2. Available Products, for Concealed Joints Only: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. OSI (a division of Henkel); Pro-Series SC-175.
 - b. Pecora Corp.; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical/Curtainwall Sealant.
3. Low-Emitting Materials: Provide sealants in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. VOC Content, Architectural Sealants: 250 g/L or less.
5. Methylene chloride and perchloroethylene may not be intentionally added to sealants.

2.8 IDENTIFICATION LABELS FOR FIRE- AND SMOKE-PARTITIONS

- A. Identification Labels: Self-adhesive signs, to comply with applicable local Code.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Wall Signs, Inc.
 - b. Marking & Identification Tape (mnitape.com).
 - c. My Safety Sign.
 - d. Safety Supply Warehouse.
 2. Text: "FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754. Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to steel roof deck.
 - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

- D. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- E. Z-Furring Members:
 - 1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
 - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 - 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

3.6 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.7 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels to minimize end joints.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. Curved-Edge Cornerbead: Use at curved openings.

- D. Aluminum Trim: Install in locations indicated on Drawings.

3.9 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
 - 1. Level 1: Ceiling plenum areas and concealed areas not exposed to view.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 3: Not Used.
 - 4. Level 4: Panel surfaces that will be exposed to view (typical panels).
 - 5. Level 5: Where indicated on Drawings.
- E. Cementitious Tile Backing Units: Finish according to manufacturer's written instructions.

3.10 INSTALLING IDENTIFICATION FOR FIRE- AND SMOKE-PARTITIONS

- A. Marking and Identification for Fire- and Smoke-Partitions: Permanently install as required by Code.

3.11 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or exhibit mold growth. Repair of damaged panels in place is not acceptable.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 095100

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Acoustical ceiling tiles and panels.
 - 2. Suspension systems, grid systems and ceiling hangers.
 - 3. Acoustical sealant at edge moldings at acoustical ceilings.
- B. Alternates: Not Applicable.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 092110 - GYPSUM BOARD ASSEMBLIES for gypsum board ceilings and soffits.
 - 2. Division 21 - FIRE SUPPRESSION for fire-suppression components located in ceilings.
 - 3. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING for air handling and distribution components located in ceilings.
 - 4. Division 26 - ELECTRICAL for light fixture and alarm system components located in ceilings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/4 inch = 1 foot.

- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6 inch square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.
- D. Asbestos Certification: Manufacturer's written certification that acoustical ceiling products contain no asbestos (0.0000%). Product labels indicating that it is the user's responsibility to test the products for asbestos are unacceptable and sufficient cause for rejection of the product on site.
- E. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Acoustical Ceiling Panels: Obtain each type through one source from a single manufacturer.
 - 2. Suspension Systems: Obtain each type through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical panels complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
- C. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong Ceilings.
 - 2. CertainTeed Ceilings.
 - 3. USG.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Ceiling Type (ACT-1): General use as indicated.
 - 1. Basis of Design: Armstrong, Canyon.
 - 2. Panel Size: 24 inches by 24 inches by 5/8 inch.
 - 3. Panel Mounting: Revealed edge.
 - 4. Noise Reduction Coefficient (NRC): Not less than 0.60.
 - 5. Ceiling Attenuation Class (CAC): Not less than 35.
 - 6. Color: White.
 - 7. Grid Material: Painted steel.
 - 8. Grid Face Width: 9/16 inch.

2.3 METAL SUSPENSION SYSTEMS

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Steel or aluminum cold-rolled sheet.
 - 5. Color: White, prefinished.

6. Grid Face Width: As specified with ACT type.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

1. Anchors in Concrete: Anchors with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency; zinc-plated for Class SC1 service.
2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106 diameter wire.

D. Hold-Down Clips: At vestibules and areas subject to wind uplift, provide manufacturer's standard hold-down clips spaced 24 inches on all cross tees.

2.4 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

B. Suspension Trim: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc.; Axiom.
2. CertainTeed Ceilings; Approved equal.
3. USG Interiors, Inc.; Compasso.

2.5 ACOUSTICAL SEALANT

A. Acoustical Sealant, for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, joint sealant, recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. OSI (a division of Henkel); Pro-Series SC-175.
 - b. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - c. Pecora Corp.; BA-98.
 - d. Specified Technologies, Inc. (STI); Smoke N Sound Acoustical Sealant.
 - e. USG; SHEETROCK Acoustical Sealant.
2. Low-Emitting Materials: Provide adhesives and sealants in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. VOC Content, Architectural Sealants: 250 g/L or less.
4. Methylene chloride and perchloroethylene may not be intentionally added to sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 6. Do not attach hangers to steel deck tabs.
 7. Space hangers not more than 48 o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
- 3.4 CLEANING
- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096513

RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Resilient wall base and accessories.
 - 2. Resilient stair accessories.
 - 3. Substrate preparation for resilient accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units of each color and pattern of resilient wall base and accessories required.
 - 1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.
- C. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.

2. During installation.
 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
 - C. Close spaces to traffic during floor covering installation.
 - D. Close spaces to traffic for 48 hours after floor covering installation.
 - E. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT WALL BASE

- A. Resilient Wall Base: ASTM F 1861.
 1. Armstrong World Industries, Inc.
 2. Burke Flooring Products.
 3. Johnsonite, a division of Tarkett.
 4. Marley Flexco (USA), Inc.
 5. Nora Systems, Inc.
 6. Roppe Corporation.
- B. Style and Colors: As indicated on the Finish Schedule.
- C. Type (Material Requirement): TS (rubber, vulcanized thermoset) or TP (rubber, thermoplastic).
- D. Shape: Straight (toeless) at carpet and coved at resilient flooring.
- E. Minimum Thickness: 0.125 inch.
- F. Height: 4 inches.
- G. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
- H. Outside Corners: Premolded.
- I. Inside Corners: Premolded.
- J. Surface: Smooth.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: 50 g/L.
 - b. Rubber Floor Adhesives: 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Alkalinity and Adhesion Testing: Perform tests recommended by flooring manufacturer. Proceed with installation only after substrate alkalinity falls within a range on pH scale not less than 5 or more than 9 pH, or as otherwise required in writing by manufacturer of flooring.
 3. Moisture Vapor Emission Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours, or as otherwise required in writing by manufacturer of flooring.
 4. Relative Humidity Testing:
 - a. Perform relative humidity test, ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level of 75 percent, or as otherwise required in writing by manufacturer of flooring.
 5. Perform tests indicated above and as recommended by flooring manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
 - 2. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION

SECTION 099000

PAINTING AND COATING

(PART OF WORK OF SECTION 090007 - PAINTING, FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Field painting of exposed interior items and surfaces.
 - 2. Field painting of exposed exterior items and surfaces.
 - 3. Surface preparation for painting.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 055000 - METAL FABRICATIONS for shop priming ferrous metal.
 - 2. Section 055150 - METAL RAILINGS for shop priming ferrous metal.

1.3 DEFINITIONS AND EXTENT

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
- B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned,

paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- D. Do NOT paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork.
 - b. Acoustical wall panels.
 - c. Toilet enclosures.
 - d. Metal lockers.
 - e. Kitchen appliances.
 - f. Elevator entrance doors and frames.
 - g. Elevator equipment.
 - h. Finished mechanical and electrical equipment.
 - i. Light fixtures.
 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 - g. Elevator shafts.
 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.4 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
 - 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
 - 3. Submit two 8 inch by 12 inch Samples for each type of finish coating for Architect's review of color and texture only.
- C. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
 - 1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft.
 - b. Small Areas and Items: Architect will designate items or areas required.
 - 2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
 - 3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work are listed in the Finish Schedule at the end of this Section.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application

indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Paint Colors (PT-#): Refer to Finish Schedule.
- D. VOC Content for Interior Paints and Coatings: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
1. Flat Paints and Coatings: 50 g/L (SCAQMD and CARB).
 2. Nonflat Paints and Coatings: 50 g/L (SCAQMD) or 100 g/L (CARB).
 3. Nonflat, High Gloss Paints and Coatings: 50 g/L (SCAQMD) or 150 g/L (CARB).
 4. Dry-Fog Coatings: 50 g/L (SCAQMD) or 150 g/L (CARB).
 5. Primers, Sealers, and Undercoaters: 100 g/L.
 6. Anticorrosive and Antirust Paints Applied to Ferrous Metals (Industrial Maintenance and Rust Preventative Coatings): 100 g/L (SCAQMD) or 250 g/L (CARB).
 7. Zinc-Rich Industrial Maintenance Primers: 100 g/L (SCAQMD) or 340 g/L (CARB).
 8. Pretreatment Wash Primers: 420 g/L.
 9. Floor Coatings: 50 g/L (SCAQMD) or 100 g/L (CARB).
 10. Shellacs, Clear: 730 g/L.
 11. Shellacs, Pigmented: 550 g/L.
 12. Clear Wood Finishes: 275 g/L.
 13. Stains, Exterior: 100 g/L (SCAQMD) or 250 g/L (CARB).
 14. Stains, Interior: 250 g/L.
- E. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions and technical bulletins for each particular substrate condition and as specified.
 1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Exterior Exposed Steel: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
 - b. Interior Exposed Steel, in Humid Environments: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
 - c. Interior Exposed Steel, in Dry Environments: Clean steel surfaces in accordance with SSPC-SP2 or SP3 Hand or Power Tool Cleaning.
 5. Galvanized Surfaces: Clean galvanized surfaces in accordance with SSPC-SP16 Brush off Blast Cleaning of Galvanized Steel and NonFerrous Metals, to achieve a minimum 1 mil anchor profile.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint backsides of access panels and removable or hinged covers to match exposed surfaces.

8. Finish exterior doors and doors in wet areas on tops, bottoms, and side edges the same as exterior faces.
 9. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
 2. Uninsulated plastic piping.
 3. Pipe hangers and supports.
 4. Tanks that do not have factory-applied final finishes.
 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.

2. Panelboards.
 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
1. The Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
 2. Testing agency will perform appropriate tests for the following characteristics as required by the Architect.
 3. The Architect may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 PAINT SCHEDULE

- A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.
- B. Exterior Paint Schedule:
 - 1. Exterior Concrete and Masonry (where indicated), Painted Finish:
 - a. One Coat:
 - 1) Tnemec 156 Enviro-Crete at 6.0 to 10 mils DFT.
 - 2) Liquid Plastics Acrylic at 8.0 to 10.0 mils DFT.
 - 3) Dupont Tufcryl at 8.0 to 10.0 mils DFT.
 - 4) RD Coatings Elasto-Flex at 6.0 to 10.0 mils DFT.
 - b. And One Coat:
 - 1) Tnemec 156 Enviro-Crete at 8 to 10 mils DFT.
 - 2) Liquid Plastics Acrylic at 8.0 to 10.0 mils DFT.
 - 3) Dupont Tufcryl at 8.0 to 10.0 mils DFT.
 - 4) RD Coatings Elasto-Flex at 6.0 to 10.0 mils DFT.
 - 2. Exterior Galvanized Metal (not shop-finished under Section 051200 - STRUCTURAL STEEL FRAMING, Section 055000 - METAL FABRICATIONS, or Section 055100 - METAL STAIRS AND RAILINGS), Alliphatic Acrylic Polyurethane System:
 - a. Surface Preparation: SSPC-SP16 Brush-off Blast of Galvanized Steel.
 - b. One Coat:
 - 1) Tnemec 66HS Hi-Build Epoxoline at 3.0 mils DFT.
 - 2) PPG PMC Amerlock 400 Hi-Build Epoxy at 4.0-5.0 mils DFT.
 - 3) Dupont 25P High Solids at 4.0 mils DFT.
 - 4) International Intergard 475 HS at 5.0 to 10.0 mils DFT.
 - c. And One Coat:
 - 1) Tnemec 73 Endura-Shield at 3.0 mils DFT.
 - 2) PPG PMC Amercoat 450H Polyurethane at 3.0 mils DFT.
 - 3) Dupont Imron 2.8 Urethane at 3.0 to 4.0 mils DFT.

- 4) International Interthane 990 HS at 3.0 to 4.0 mils DFT.
3. Exterior Ferrous Metal, Urethane System:
- a. Surface Preparation: SSPC-SP6.
 - b. One Coat:
 - 1) Tnemec 90G-1K97 at 3 mils DFT; shop applied under other Sections; use for touch up.
 - 2) PPG PMC Amercoat 68 MCZ at 3 mils DFT; shop applied under other Sections; use for touch up.
 - 3) Dupont Urethane Ganicin Zinc Rich Primer 80%zinc load at 3.0 mils DFT.
 - 4) International Interzinc 315 at 2.0 to 3.0 mils DFT.
 - c. And One Coat:
 - 1) Tnemec 66HS Hi-Build Epoxoline at 3.0 mils DFT.
 - 2) PPG PMC Amerlock 400 Hi-Build Epoxy at 3.0 to 5.0 mils DFT.
 - 3) Dupont 25P High Solids Epoxy at 4.0 to 6.0 mils DFT.
 - 4) International Intergard 475 HS at 4.0 to 8.0 mils DFT.
 - d. And One Coat:
 - 1) Tnemec 73 Endura-Shield at 3.0 mils DFT.
 - 2) PPG PMC Amerlock 450H Polyurethane Topcoat at 3.0 mils DFT.
 - 3) Dupont High Solids Imron Urethane at 4.0 mils DFT.
 - 4) International Interthane 990 HS at 2.0 to 3.0 mils DFT.
4. Exterior Existing Prepainted Steel, for Overcoat Painted Finish:
- a. Surface Preparation: Water Blast 5000 psi and SSPC-SP3 Power Tool Clean.
 - b. One Coat:
 - 1) Tnemec 394 Omnithane at 3.0 to 3.5 mils DFT.
 - 2) PPG PMC Amerlock 400 Hi-Build Epoxy at 3.0 to 4.0 mils DFT.
 - 3) RD Coatings Elasto Metal at 3.0 mils DFT.
 - 4) International Interplus 356 at 3.0 to 5.0 mils DFT.
 - c. And One Coat:
 - 1) Tnemec 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.
 - 2) PPG PMC Amerlock 400 at 3.0 to 4.0 mils DFT.
 - 3) RD Coatings Elasto Metal at 7.0 mils DFT.
 - 4) International Intergard 475 HS at 5.0 to 10.0 mils DFT.
 - d. And One Coat:
 - 1) Tnemec 73 Endura-Shield at 3.0 to 5.0 mils DFT.
 - 2) PPG PMC Amercoat 450H at 3.0 mils DFT.
 - 3) RD Coatings MurCryl at 3.0 to 4.0 mils DFT.
 - 4) International Interthane 990 HS at 3.0 to 4.0 mils DFT.
- C. Interior Paint Schedule, Typical:

1. Interior Gypsum Wallboard and Plaster, Latex Paint Finish:
 - a. One Coat, Primer:
 - 1) Imperial Paints ECOS Interior Wall Primer.
 - 2) Moore Ultra Spec 500 Interior Latex Primer 534.
 - 3) PPG Speedhide Zero VOC Interior Primer 6-4900XI.
 - 4) S-W Harmony Interior Primer B11 series.
 - 5) S-W ProMar 200 HP Zero VOC Interior Primer.
 - b. And Two Coats, Flat Finish: At ceilings and elsewhere as indicated.
 - 1) Imperial Paints ECOS Interior Flat.
 - 2) Moore Ultra Spec 500 Interior Latex Flat 536.
 - 3) PPG Speedhide Zero VOC Interior Latex Flat 6-4110XI.
 - 4) S-W ProMar 400 HP Zero VOC Interior Flat.
 - c. And Two Coats, Eggshell Finish: At walls and elsewhere as indicated.
 - 1) Imperial Paints ECOS Interior Eggshell.
 - 2) Moore Ultra Spec 500 Interior Latex Low Sheen 537.
 - 3) PPG Speedhide Zero VOC Interior Latex Eggshell 6-4310XI.
 - 4) S-W ProMar 200 HP Zero VOC Interior Eg-Shel.
 - or
 - d. And Two Coats, Semi-Gloss Finish: At toilet rooms, other wet areas, and elsewhere as indicated.
 - 1) Imperial Paints ECOS Interior Satin.
 - 2) Moore Ultra Spec 500 Interior Latex Semi-Gloss 539.
 - 3) PPG Speedhide Zero VOC Interior Latex Semi-Gloss 6-4510XI.
 - 4) S-W ProMar 200 HP Zero VOC Interior Semi-Gloss.
2. Interior Concrete Walls Exposed to View, Urethane Coating:
 - a. Surface Preparation: Cured, clean and dry, free of surface contaminants.
 - b. And One Coat:
 - 1) Tnemec 201 Epoxoprime at 3.0- 4.0 mils DFT.
 - 2) PPG PMC Amerlock Sealer at 3.0 to 4.5 mils DFT.
 - 3) Dupont Hi-Solids Colar primer at 3.0 to 4.0 mils DFT.
 - 4) International Interseal 670 HS at 3.0 to 4.0 mils DFT.
 - c. And One Coat:
 - 1) Tnemec 280 Tneme-glaze at 6.0 to 8.0 mils DFT.
 - 2) PPG PMC Amercoat 351 Epoxy at 6.0 to 8.0 mils DFT.
 - 3) Dupont 100 % Solids Epoxy at 8.0-10.0 mils.
 - 4) International Interseal 670 HS at 3.0 to 4.0 mils DFT.
 - d. And One Coat:
 - 1) Tnemec 1080 or 1081 EnduraShield at 3.0 to 3.5 mils DFT.

- 2) PPG PMC AmerShield VOC at 2.0 to 3.0 mils DFT.
 - 3) Dupont WB Urethane at 3.5 to 4.0 mils DFT.
 - 4) International Water Borne Urethane at 3.0 to 4.0 mils DFT.
3. Interior Concrete Ceiling (both new and previously painted), Painted Finish:
- a. Surface Preparation: Cured clean and dry.
 - b. One Coat:
 - 1) Tnemec 151 Elasto-grip at 2.0 mils DFT.
 - 2) RD Coatings Multiprim at 1.0-2.0 mils DFT.
 - c. And Two Coats:
 - 1) Tnemec 158 Biolastic at 8.0 mils DFT.
 - 2) RD Coatings ElastoFlex at 6.0 to 8.0 mils DFT.
4. Interior Concrete Floor System, Waterborne Urethane, dry film thickness 28 mils:
Surface preparation: Grind concrete; shot-blast not required.
- a. Primer: RD Unifix at 1.0-1.5 mils DFT.
 - b. Second Coat: RD Elastodeck Slurry with broadcast aggregate, 25 mils DFT.
 - c. Third Coat: RD Monograph pigmented topcoat, 2-3 mils DFT.

END OF SECTION

SECTION 101400

SIGNAGE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Code-required interior panel signage, including but not limited to, accessibility signage, toilet room signage and mechanical and electrical room signage.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Division 26 - ELECTRICAL for illuminated exit signs.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
- C. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
 - 1. Panel Signs: Full-size Samples of each type of sign required.
 - 2. Approved samples will not be returned for installation into Project.
- D. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each sign type through one source from a single manufacturer.

- B. Regulatory Requirements: Comply with the Massachusetts Architectural Access Board, Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

- A. General: Provide signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction as indicated. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally. Provide the following:
 - 1. Code-Required Signs for Certificate of Occupancy:
 - a. Type: Photopolymer on acrylic or printed acrylic / aluminum as applicable.
 - b. Color: Selected from manufacturer's standard colors including metallic silver, off white, champagne, light gray, dark red, dark green, dark blue, dark bronze, charcoal.
 - c. Type Size: As selected.
 - d. Typeface: As selected.
 - 2. Interior Signs Based on Owner's Requirements:
 - a. Type: Photopolymer on acrylic or printed acrylic as applicable.
 - b. Color: Selected from manufacturer's standard colors including metallic silver, off white, champagne, light gray, dark red, dark green, dark blue, dark bronze, charcoal.
 - c. Type Size: As selected.
 - d. Typeface: As selected.
 - 3. Exterior Signs:
 - a. Type: As indicated on the Drawings.
- B. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Raised-Copy Thickness: Not less than 1/32 inch

C. Symbols of Accessibility: Provide 6-inch- high symbol fabricated from opaque nonreflective vinyl film, 0.0035-inch nominal thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.

2.2 ACCESSORIES

A. Mounting Methods: Use double-sided vinyl tape fabricated from materials that are not corrosive to sign material and mounting surface.

B. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:

1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by the Architect.

END OF SECTION

SECTION 102600

WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Corner guards.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 055000 - METAL FABRICATIONS.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Corner Guards: 12 inches long.
- C. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Division 01 Sections.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 2. Keep plastic sheet material out of direct sunlight.
 3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M.
- B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- C. Adhesive: Type recommended by manufacturer for use with material being adhered to substrate indicated.
- D. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- E. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Wood Glues: 30 g/L.
 2. Contact Adhesive: 80 g/L.
 3. Special Purpose Contact Adhesive: 250 g/L.

2.2 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated from 1-piece, formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Balco, Inc.
 - b. Boston Retail Products.
 - c. Construction Specialties, Inc.
 - d. IPC Door and Wall Protection Systems; Division of InPro Corporation.
 - e. Korogard Wall Protection Systems; Division of RJF International Corporation.
 - f. Nystrom Building Products.
 - g. Pawling Corporation.
2. Material: Stainless steel, Type 304.
 - a. Thickness: Minimum 0.0781 inch.
 - b. Finish: Directional satin, No. 4.
3. Wing Size: Nominal 3-1/2 by 3-1/2 inches.
4. Corner Radius: 1/8 inch.
5. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes.

2.3 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.4 METAL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 1. Remove tool and die marks and stretch lines or blend into finish.
 2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.5 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, polished finish indicated, free of cross scratches.

1. Run grain of directionally textured finishes with long dimension of each piece.
- C. Directional Satin Finish: No. 4 finish.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
1. Provide mounting hardware, anchors, and other accessories required for a complete installation.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a low VOC, non-ammonia-, non-chlorine, and non-solvent-based, household cleaning agent.

END OF SECTION

SECTION 220000

PLUMBING

(TRADE BID REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents and applicable parts of Division 01 – GENERAL REQUIREMENTS shall be included in, and made a part of this Section.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.
- C. Reference Drawings: The Work of this Trade Bid is shown on the following Contract Drawings:

- P1.00 BASEMENT LEVEL PLUMBING PLAN & LEGEND
 - P1.01 FIRST FLOOR PLUMBING PLAN - DEMOLITION
 - P1.02 FIRST FLOOR PLUMBING PLAN - DEMOLITION
 - P1.03 SECOND FLOOR PLUMBING PLAN - DEMOLITION

- P2.01 FIRST FLOOR PLUMBING PLAN - NEW WORK
 - P2.02 FIRST FLOOR PLUMBING PLAN - NEW WORK
 - P2.03 SECOND FLOOR PLUMBING PLAN - NEW WORK
 - P2.04 ROOF LEVEL PLUMBING PLAN - NEW WORK
 - P2.05 ROOF LEVEL PLUMBING PLAN - NEW WORK

- D. Sub-Bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the Invitation to Bid and Instructions to Bidders.

- 1. The following shall appear on the upper left corner of the envelope:

- NAME OF BIDDER: _____

- SUB-BID FOR TRADE: PLUMBING

- 2. Each Sub-Bid submittal for work under this Section shall be on forms furnished by Awarding Authority, as bound herein, accompanied with the required bid deposit in compliance with MGL c149, Section 44B in the amount of 5 percent of the Filed Sub-Bid.

- E. Sub Sub-Bid Requirements: Not Applicable.

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. Replacement of roof drains to accommodate new roof insulation thickness.
 2. Replacement of horizontal rain water leader piping below the roof.
 3. Insulation of new horizontal rain water leader piping and roof drain bodies.
 4. Extension of existing Plumbing vents thru roof (VTR).
 5. Extension of gas piping to raised rooftop unit.
 6. Raising of existing horizontal gas piping on roof to accommodate new roof insulation thickness.
 7. Hoisting equipment for the Work of this Section.
 8. Coordination with General Contractor for use of staging, planking and scaffolding, interior and exterior, which is the responsibility of the General Contractor as specified in Section 011000 - GENERAL REQUIREMENTS.
- B. Alternates: None.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 075400 - THERMOPLASTIC MEMBRANE ROOFING for coordination with roofing subcontractor.
 2. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING for coordination with HVAC roof exhaust fans and rooftop units.
- F. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
- G. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.
- H. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

1.3 SUBMITTALS

- A. Comply with requirements specified in Section 011000 - GENERAL REQUIREMENTS.
- B. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:

1. Piping.
2. Fittings, unions, flanges and couplings.
3. Roof drains.
4. Insulation.

- C. **This contractor shall include the Massachusetts State Plumbing Board Product Approval number for each product as part of the submittal.**

1.4 DEFINITIONS

- A. As used in this Section, "provide" means "furnish and install" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

1.5 CONTRACT DOCUMENTS

- A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, HVAC, Plumbing, Fire Protection, Electrical, Structural, and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.
- B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.
- D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.
- E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.
- F. Data that may be furnished electronically by the Designer (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Designer's sealed or stamped construction documents.

1.6 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer's interpretation of Contract Documents shall be final,

and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.

- B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.
- D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with the paragraph above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.
- E. In cases covered by the paragraph above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.7 MODIFICATIONS IN LAYOUT

- A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.
- B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.
- C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.
- D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.
- E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.8 SITE VISIT

- A. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional

work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer.

1.9 EXISTING CONDITIONS AND PREPARATORY WORK

- A. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by User Agency. Report conditions that might affect work adversely in writing through Contractor to Designer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.10 CODES, STANDARDS, AUTHORITIES AND PERMITS

- A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:
1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
 2. American Gas Association (AGA).
 3. National Fire Protection Association (NFPA).
 4. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
 5. Occupational Safety and Health Act (OSHA).
 6. Factory Mutual Association (FM) if applicable to project.
 7. Underwriters' Laboratories (UL).
 8. American National Standards Institute (ANSI).
 9. Compressed Gas Association (CGA).
 10. Canadian Standards Association (CSA).
 11. United States Pharmacopeia (USP).
- B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.
- C. When requirements cited in this Specification conflict with each other or with Contract Documents, most stringent shall govern work. Designer may relax this requirement when such relaxation does not violate ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing.
- D. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:
1. American National Standards Institute (ANSI).
 2. American Society of Mechanical Engineers (ASME).
 3. National Electric Manufacturers Association (NEMA).
 4. American Society for Testing and Materials (ASTM).
 5. American Water Works Association (AWWA).
 6. Thermal Insulation Manufacturers Association (TIMA).
 7. Institute of Electrical and Electronics Engineers (IEEE).
 8. Insulated Cable Engineers Association (ICEA).
 9. National Fire Protection Association (NFPA).

- E. All Plumbing and Gas products shall be approved by the Massachusetts State Plumbing Board.

1.11 GUARANTEE AND 24 HOUR SERVICE

- A. Guarantee Work of this Section in writing for one year following the date of Substantial Completion. If the equipment is used for ventilation, temporary heat, etc. prior to Substantial Completion, the bid price shall include an extended period of warranty covering the one-year of occupancy, starting from the initial date of Substantial Completion. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.
- B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in User Agency's name.
- C. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.
- D. Provide 24 hour service beginning on the date the project is first occupied for public use by the User Agency, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to UML. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and UML's Project Manager approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.
- E. Submit copies of equipment and material warranties to Designer before final payment.
- F. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to User Agency.
- G. This Paragraph shall not be interpreted to limit UML's Project Manager's rights under applicable codes and laws and under this Contract.
- H. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph.
- I. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use by User Agency, and shall not institute guarantee period.
- J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to UML's Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will suggest course of action.

1.12 RECORD DRAWINGS

- A. Comply with requirements specified in Section 011000 - GENERAL REQUIREMENTS.
- B. All "main air" pneumatic control piping routing locations must be shown on the record drawings.

- C. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.13 BULLETINS, MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

- A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field-assembled units, including as built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:
 - 1. Directions for and sequence of operation of each item of Plumbing systems. Sequence shall list valves, switches, and other devices used to start, stop and control system. Include approved valve directory showing each valve number, location of each valve, and equipment or fixture controlled by valve.
 - 2. Detailed maintenance and trouble shooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.
 - 3. Lubrication instructions detailing type of lubricant, amount, and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.
- B. Furnish three copies of manuals to Designer for approval and distribution to UML's Project Manager. Deliver manuals no less than 30 days prior to acceptance of equipment to permit User Agency's personnel to become familiar with equipment and operation prior to acceptance.
- C. Provide framed and glazed charts as follows: mount as directed by Designer.
 - 1. Flow diagrams from first part of manual as described above.
 - 2. Valve directory.
 - 3. Lubrication chart from third part of manual.
- D. Operating instructions: Upon completion of installation or when UML's Project Manager accepts portions of building and equipment for operational use, instruct User Agency's operating personnel in any or all parts of various systems. Instructions shall be performed by factory trained personnel. User Agency shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.
- E. Each contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.
- F. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

PART 2 - PRODUCTS

2.1 PIPING, FITTINGS AND JOINTS

A. General:

1. Pipe and fittings shall conform to the latest ANSI, ASTM, NFPA and AWWA Standards including latest amendments.
2. Each length of pipe, each pipe fitting, trap, material and/or device used in the respective system shall have cast, stamped or indelibly marked on it, the maker's name or mark, weight and quality of the product when such marking is required by the approved standard that applies.
3. Piping and fittings shall be factory coated.
4. Pro-press type piping and fittings may be used, but shall be limited to domestic water lines, 2 inches or less in diameter.

B. Sanitary Drainage and Rainwater Leader Piping Above Floor (Soil, Waste, and Vent)

1. Piping 2 in. and larger shall be no-hub service weight cast iron soil pipe except at urinals and cleanouts and joints just prior to exiting the building which shall be service weight hub and spigot with lead and oakum joints.
2. Piping 2 in. and smaller shall be type "L" copper.
 - a. In lieu of soldered joints for 2 in. through 8 in. type "L" copper tubing systems, Victaulic or approved equal by Grinnell or Anvil Gruvlok grooved joint couplings and fittings may be used. Fittings shall be ASME B16.22 wrought copper or ASME B16.18 bronze casting with copper tubing sized grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
 - b. Couplings shall consist of two ductile iron housings cast with offsetting, angle-pattern bolt pads coated with copper-colored enamel, pressure-responsive, synthetic rubber gasket (Grade "T" Nitrile), and plated steel bolts and nuts. Victaulic Style 607 or approved equal by Grinnell or Anvil Gruvlok.
3. Couplings for joining no-hub cast iron soil pipe: Couplings shall have a shield constructed of corrugated 304 stainless steel and provide a shield thickness of 0.16 inches or greater. Shield shall be a minimum width of 3 inches for pipe sizes 1-1/2 inch through 4 inch, and a minimum width of 4 inches for pipe sizes 5 inch through 10 inches. Couplings with at least 4 sealing bands shall require 80 inch pounds of torque per band. Tightening screws shall be 3/8 inch hexagon head. Couplings with only 2 sealing bands on sizes 1-1/2 inch through 4 inches shall require 125 inch pound of torque per band. Gaskets shall be neoprene rubber conforming to ASTM C-564.
4. Joints in copper tubing except as otherwise specified herein shall be made according to manufacturer's specifications using sweat fitting and lead free solder and non corrosive flux.
5. Connections between earthenware of any fixture and flanges in soil and waste piping shall be made absolutely gas and watertight with closet setting compounds and gaskets which must be absolutely gas and fireproof, watertight, stainproof, containing neither oil nor asphaltum and which will not rot, harden or dry under any extreme climatic change, and must adhere on wet surfaces.

C. Sanitary Drainage and Rainwater Leader Piping Below Floor (Soil, Waste and Vent)

1. Piping below floor shall be service weight cast iron hub and spigot.

2. Joints in cast iron soil piping below ground shall be code approved compression type, made with rubber gaskets conforming to ASTM Specification C564. Joints in cast iron soil pipe and fittings using a double seal, compression type molded neoprene gasket shall be provided with a modified hub as required to provide a positive seal. No hub pipe will not be allowed below ground.

D. Water Piping (Domestic, Non-Potable and Tempered)

1. Above Ground

- a. 1-1/2 inches and smaller shall be hard drawn Type L copper with push-to-connect fittings. Fittings shall be ASME B16.18 cast copper alloy or ASME B16.22 wrought copper with stainless steel teeth and EPDM synthetic rubber o-ring seal in each end (UL classified in accordance with NSF-61 for hot (+180°F) and cold (+86°F) potable water service) with push-to-connect ends instead of solder-joint ends.
- b. 2-1/2 inches and smaller shall be hard drawn Type L copper with wrought or cast copper fittings.
- c. 2 inches and larger may be hard drawn Type L copper with Victaulic or approved equal by Grinnell or Anvil Gruvlok roll grooved mechanical couplings.
 - 1) Victaulic or approved equal by Grinnell or Anvil Gruvlok grooved end fittings shall be ASME B16.22 wrought copper or ASME B16.18 bronze castings with copper tubing sized grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
 - 2) Couplings shall be "Installation Ready" stab-on design for direct "stab" installation onto roll grooved copper tube without prior field disassembly and no loose parts. Coupling shall consist of two ductile iron housings cast with offsetting, angle-pattern bolt pads coated with copper-colored enamel, pressure-responsive, synthetic rubber gasket (Grade "EHP" EPDM), and plated steel bolts and nuts. Victaulic Style 607 QuickVic or approved equal by Grinnell or Anvil Gruvlok.
 - 3) Flange adapters shall be copper tube dimensioned, ductile iron casting coated with copper-colored enamel, flat face, designed for direct connection to ANSI Class 125 and 150 flanged components. Victaulic Style 641 or approved equal by Grinnell or Anvil Gruvlok.
- d. Joints in copper tubing except as otherwise specified herein shall be made according to manufacturer's specifications using sweat fitting and lead free solder and non corrosive flux.
- e. Provide galvanized malleable iron unions, with bronze facings conforming to ANSI B16.39 for sizes 2 inch and smaller.
- f. Provide steel flanges conforming to ANSI B16.5, standard or welding neck pattern.

E. Natural Gas and Gas Relief Vents

1. 2 inches and smaller shall be Schedule 40 black steel pipe with malleable iron threaded cast fittings ASTM B16.3, Class 150.
2. 2-1/2 inches and larger shall be schedule 40 black steel pipe in accordance with ASTM A.53 with butt welding fittings in accordance with ANSI B16.9.
3. Gas piping at equipment shall be provided with additional supports.
4. All work shall be installed in strict accordance with the Massachusetts State Gas Code.
5. Welders Qualifications (Natural Gas System): Qualifications of the procedure and of the welding operations and welders shall be as specified in American Welding Society, AWS D10.9-80, "Specification for Qualification of Welding Procedures and Welders for Pipe and Tubing"; ANSI B31.1 and ASME Boiler Code, Section 1X.
 - a. The Contractor shall provide certification in writing that the operator or welder has met the above prescribed standard. UMA's Project Manager reserves the right to

radio graphically test a minimum of 5% of the welds. Comply with requirements of Section 014325 - TESTING AGENCY SERVICES.

F. Unions and Flanges

1. Unless otherwise specified herein, unions for copper and brass piping two inches and smaller in diameter shall be 125 SWP, bronze body brass ground joint type. Those larger than two inches in diameter shall be 150 SWP flat faced cast brass flanges conforming to ANSI Standard B16.24.
2. Where brass flanges and ferrous flanges are to be joined, ferrous flanges shall be full faced.
3. Mating of ferrous and non ferrous flanges shall be separated with rubber gaskets (1/16 inch minimum thickness) and Teflon liners installed in the bolt holes. Bolt holes shall be drilled to receive the Teflon lines. Physical contact between the ferrous and non ferrous flanges including the bolts, nuts and washers will not be permitted.
4. Unions for ferrous piping shall be of the same material as the piping to which they connect.
5. On grooved piping systems, the couplings shall act as the union
6. Grooved flange adapter Victaulic Style 641 or approved equal by Grinnell or Anvil Gruvlok for direct connection to CL 150 flanged components.

2.2 HANGERS AND ACCESSORIES

A. General

1. Provide pipe stands, supports, hangers and other supporting appliances as necessary to support work required by Contract Documents. All components of the hanger support system shall comply with the standards set forth in MSS-SP58 and MSS-SP69 (Manufacturers Standardization Society) latest publication.
2. Manufacturers: Subject to compliance with requirements, provide hangers and supports of Carpenter and Patterson, Inc, ITT Grinnel Corp., Elecon Metal Products or approved equal.

B. Secure vertical piping to building construction to prevent sagging or swinging.

C. Space hangers for horizontal piping as follows:

Pipe Size	Rod Diameter	Maximum Spacing
1/2 and 3/4 in.	3/8 in.	6 ft.- 0 in.
1 in. and 1-1/4 in.	3/8 in.	8 ft.-0 in.
1-1/2 and 2 in.	3/8 in.	10 ft.-0 in.
2-1/2 and 3 in.	2 in.	10 ft.-0 in.

D. Friction clamps shall be equal to Figures 126 and copper plated when in direct contact with copper or brass piping.

E. Hangers for uncovered (uninsulated) copper or brass piping 2 in. and smaller shall be Carpenter & Patterson Figure 1ACT steel, copper plated band type.

- F. Hangers for uncovered (uninsulated) steel or cast iron piping 2 in. and smaller shall be Carpenter & Patterson Figure 1A steel band type.
 - G. Hangers for uncovered (uninsulated) steel or cast iron piping 2-1/2 in. and larger shall be Carpenter & Patterson Figure 100 steel clevis type.
 - H. Hangers for all insulated piping shall be Carpenter & Patterson Figure 100 steel clevis type with insulation shield specified below.
 - I. Hangers for uncovered (uninsulated) copper or brass piping 2-1/2 in. and larger shall be factory applied copper plated steel clevis hangers, Carpenter & Patterson Fig. 100 CT. Rods and nuts used with these hangers shall also be factory applied copper plated.
 - J. Where three or more pipes are running parallel to each other, factory fabricated gang type hangers with pipe saddle clips, or rollers may be used in lieu of the hereinbefore specified Clevis hangers. These hangers shall be sized to provide for insulation protectors as hereinafter specified. Pipe saddle clips shall be not less than 16 gauge metal and shall be copper when installed with uninsulated copper piping. Where pipe rollers are provided for uninsulated copper or brass piping, insulation protectors shall be provided at each set of rollers and filled with a section of heavy density fiberglass pipe covering specified hereinafter. (Refer to insulation of this specification.) Fig. 342 sized to suit loading with hanger rods and nuts.
 - K. Extension type split ring hangers with wall plates shall be equal to Carpenter & Patterson Figures 81, 81 CT, 90 CT and 85, 85 CT plates for iron, steel and copper.
 - L. Hanger rods for other installations shall be sized in accordance with the recommended load capacities of ASTM Specifications Designation A 107, latest amendment.
 - M. Insulation protectors (shields) for horizontal piping shall be constructed of galvanized steel formed to a 180 degree arc and 12 inches long, equal to Carpenter & Patterson Figure 265P, 18 gauge type H for hangers 5 inches in size and smaller, 16 gauge for hangers larger than 5 inches in size.
 - N. Exposed rods, clamps and hangers shall be electrogalvanized coated.
 - O. Installation of hangers which permit wide lateral motions of any pipe will not be acceptable.
 - P. "C" clamps installed with pipe hangers or equipment hangers will not be permitted unless provided with retaining straps.
 - Q. All no-hub cast iron pipe 6 inches or larger in diameter shall be braced to prevent horizontal movement as required by code and recommended by the Cast Iron Soil Pipe Institute by using braces, blocking or rodding as illustrated in the CISPI Handbook, Vol. II, Specification Section 310-78.
- 2.3 INSERTS AND ESCUTCHEONS
- A. 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 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.

- B. Unless otherwise specified herein, escutcheons shall be cast brass chrome plated type and provided with a set screw to properly hold escutcheon in place.

2.4 CLEANOUTS AND DRAINS

- A. Cleanouts shall be Jay R. Smith, Josam, Zurn or approved equal.
- B. Bodies of cleanout ferules in hub and spigot or no hub piping shall be standard pipe size conforming in thickness to that required for pipe and fittings, and shall extend not less than 3/4 inch above the hub of the pipe. The cleanout plug shall be of cast brass and shall be provided with a raised nut 3/4 inch high. Cleanouts in copper waste piping shall be soldered brass cleanout fittings with extra heavy brass screw plugs of the same size as the pipe line. Cleanouts in threaded waste piping shall be cast iron drainage "T" pattern 90 degree branch fittings with extra heavy brass screw plugs of the same size as the pipe.
- C. Floor cleanouts shall be as follows:
 - 1. General purpose flush finished floor cleanout with adjustable top shall be equal to Jay R. Smith Series 4026.
 - 2. Wall cleanout with cleanout tee and square frame and cover shall be equal to Jay R. Smith Series 4558.
- D. Roof drains shall be Zurn #Z-100, or approved equal, by J.R. Smith or Wade. Roof drain shall be suitable for new roof insulation thickness and furnished with 16-gauge Type 304 stainless steel body, neoprene gasket and Dura-Coated cast iron clamp collar and dome with stainless steel hardware.

2.5 PIPE COVERING

- A. General
 - 1. The pipe covering specified herein for piping system shall be provided to strict accordance with the manufacturer's printed instructions, the best practice of the trade and to the full intent of this Specification.
 - 2. Flame/Smoke Ratings: Provide complete fibrous glass pipe insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
 - 3. Manufacturer: Subject to compliance with requirements, provide products of Armstrong World Industries, Inc., Knauf Fiber-Glass, Owens Corning or approved equal.
 - 4. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.
 - 5. No leaks in vapor barrier or voids in insulation will be accepted.
 - 6. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or smoke partitions shall have space allowed for application of approved packing between sleeves and piping, to provide firestop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.
- B. Interior Cold, Hot Water and Above Ground Horizontal and Vertical Storm Drainage Systems:
 - 1. 1 in. thickness fiberglass piping insulation:
 - a. ASTM E-547, Class I

2. Fire retardant foil face jackets for piping insulation: ASTM C-921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at installation option.
3. Encase piping fittings insulation with one piece pre-molded PVC fitting covers, fastened as per manufacturer's recommendations.
4. Encase exterior piping insulation with aluminum jacket with weatherproof construction.
5. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

2.6 PIPING IDENTIFICATION

A. Piping: Provide clip-on color-coded piping identification markers on mechanical piping systems specified in Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING. Provide matching flow arrows to indicate direction of flow. Markers shall be equal to Seton Setmark. Pipe marking for outside diameters of 6 inches or greater may be springs or metal bands secured to the corners at each end of the semi-rigid plastic marker to hold each end of the marker firmly against the pipe.

1. Color coding and size of legend letters shall comply with the standards of ANSI A13.1.
2. Provide markers with legend letters sized in compliance with the following schedule:

<u>Outside Diameter (Over Insulation)</u>	<u>Size of Letters:</u>	<u>Length of Color Code:</u>
1-1/4 inch and smaller	2 inch	8 inches
1-1/2 inch to 2 inch	3/4 inch	8 inches
2-1/2 inches to 6 inches	1-1/4 inch	12 inches

3. Plumbing Systems: Provide color-coded identification markers in compliance with the following schedule with contrasting legend letters.

<u>Service</u>	<u>Identification</u>	<u>Color Code</u>
Cold Water	Dom. Cold Water	Green
Hot Water	Dom. Hot Water	Green
Hot Water Return	Dom. Hot Water Return	Green
Soil or Waste	Sanitary	Yellow
Vent	Plumbing Vent	Yellow
Rainwater	Storm	Green
Unsafe Water	Non-Potable	Yellow
Fuel Gas	Fuel Gas	Yellow

PART 3 - EXECUTION

3.1 IDENTIFICATION

- A. All equipment and each length of pipe fitting, trap, fixture, control panel, starter and device used in the systems shall have a permanently attached nameplate or be cast, stamped or indelibly marked with the manufacturer's mark or name, the weight, type and class. The nameplates shall be kept clean and readable at all times.
- B. Painting

1. Finished field painting of designated plumbing works shall be performed under Section 09 90 00 - PAINTING AND COATING.
2. All unpainted, non insulated, non galvanized, ferrous metal surfaces only of conduits, pipes, equipment, hangers, supports, accessories, and so forth, furnished and installed by this Subcontractor, shall be painted as follows by this Subcontractor. Concealed and Exposed one prime coat of metal primer. Underground two coats of black asphaltum paint.
3. Surfaces which will be inaccessible for painting after installation shall be painted before installation.
4. Surfaces to be painted shall be thoroughly cleaned of all scale, rust, dirt, oil and other foreign matter and shall be completely dry before applying paint.
5. After installation, equipment and accessories with factory primed or finished surfaces shall be cleaned, and bare or marred spots refinished and/or touched up by each Subcontractor with the same type paint and process as applied at the factory.
6. Nameplates on all equipment shall be cleaned and left free of paint.
7. Materials and workmanship shall be equal to the requirements specified under Section 09 90 00 - PAINTING AND COATING.

3.2 DISINFECTION, CLEANING AND ADJUSTING

A. Disinfection

1. Each potable water system (cold and hot water) shall be cleaned and disinfected by this Contractor. Cleaning and disinfection shall be performed after all pipes, valves, fixtures and other components of the systems are installed, tested and ready for operation.
2. All hot and cold water piping shall be thoroughly flushed with clean potable water, prior to disinfection, to remove dirt and other contaminants. Screens of faucets shall be removed before flushing and re installed after completion of disinfection.
3. Disinfection shall be done using sodium hypochlorite in the following manner:
 - a. A service cock shall be provided and located at the water service entrance. The disinfecting agent shall be injected into and through the system from this cock only.
 - b. The disinfecting agent shall be injected by a proportioning pump or device through the service cock slowly and continuously at an even rate. During disinfection, flow of disinfecting agent into main water supply is not permitted.
 - c. All sectional valves shall be opened during disinfection. All outlets shall be fully opened at least twice during injection and the residual checked with orthotolidin solution.
 - d. When the chlorine residual concentration, calculated on the volume of water the piping will contain indicated not less than 50 ppm (parts per million) at all outlets, then all valves shall be closed and secured.
 - e. The residual chlorine shall be retained in the piping systems for a period of not less than 24 hours.
 - f. After the retention, the residual shall be not less than five parts per million. If less, then the process shall be repeated as described above.
 - g. If satisfactory, then all fixtures shall be flushed with clean potable water until residual chlorine by orthotolidin tests shall be not greater than the incoming water supply. (This may be zero.)
4. All work and certification of performance shall be performed by approved applicators or qualified personnel with chemical and laboratory experience. Certification of performance shall indicate:
 - a. Name and location of the job and date when disinfection was performed.
 - b. Material used for disinfection.
 - c. Retention period of disinfectant in piping system.

- d. ppm chlorine during retention.
 - e. ppm chlorine after flushing.
 - f. Statement that disinfection was performed as specified.
 - g. Signature and address of company or person performing disinfection.
5. Upon completion of final flushing (after retention period) the plumbing subcontractor shall obtain a minimum of one water sample from each hot and cold water line and submit samples to a State approved laboratory. Samples shall be taken from faucets located at highest floor and furthest from meter or main water supply. The laboratory report shall show the following:
- a. Name and address of approved laboratory testing the samples.
 - b. Name and location of job and date the samples were obtained.
 - c. The coliform organism count. (An acceptable test shall show the absence of coliform organisms.)
6. If analysis does not satisfy the above minimum requirements, the disinfection procedure shall be repeated.
7. Before acceptance of the systems, this Contractor shall submit to UMA's Project Manager for his review, three (3) copies of Certification of Performance as specified above.
8. Under no circumstances shall this contractor permit the use of any portion of domestic water systems until properly disinfected, flushed and certified.

B. Cleaning and Adjusting

1. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by operation of the system for testing.
2. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishings due to the Plumbing subcontractor's failure to properly clean the piping system shall be repaired by this Contractor at no increase in Contract costs.
3. At the completion of the work, all water systems shall be adjusted for quiet operation.
4. All automatic control devices shall be adjusted for proper operation.
5. All plumbing fixtures and exposed metal work shall be cleaned and polished. Floor drain strainers and traps shall be cleaned of all debris.
6. All items of equipment shall be thoroughly inspected. Any items dented, scratched or otherwise damaged in any manner shall be replaced or repaired and painted to match the original finish. All items so repaired and refinished shall be brought to the attention of the Designer and Owner's Project Manager for inspection and approval.

3.3 SYSTEMS

A. Sanitary Waste and Storm Drainage System

1. The Plumbing subcontractor shall be responsible for checking each pipe for alignment, center line elevation and invert grade for underground installations.
2. At times when work is not in progress, open ends of pipe and fittings shall be securely closed to the satisfaction of the Project Manager so that no trench water, earth or other substance will enter the pipe or fittings. Any section of a building drainage system that is found defective in material, alignment, grade or joints before acceptance shall be corrected to the satisfaction of UMA's Project Manager. Pipe laid through rock excavation shall rest on a six inch layer of well compacted sand.
3. The sanitary (soil, waste and vent), storm and basement drainage piping three inches and smaller in diameter shall pitch a minimum of 1/4 inch per foot. Piping four inches and larger in diameter shall pitch a minimum of 1/8 inch per foot.

4. The soil, waste and vent stacks shall be connected as shown and extended through the roof a minimum of 18 inches. Soil, waste and vent pipes shall be concealed unless otherwise noted.
5. Branch connections to each drainage system shall be made with "Wye" and long turn "Tee Wye" fittings. Installation of short radius 1/4 bends, common off sets, double hub fittings and saddles will not be approved. Installation of short "Tee Wye" fittings will be permitted for vertical piping only, and only where space conditions will not permit the use of long turn fittings. Only fittings conforming to the Code shall be installed.
6. The changes in direction of each drainage system shall be made with "Wye" branches and 1/8 bends. Provide long sweep bends at bottom of stacks with a vertical cleanout just above the floor at places where a "Wye" and 1/8 bends and end cleanouts cannot be installed.
7. Every fixture shall be separately trapped and the traps must be vented unless an approved battery vented system is being installed. Floor drains shall be considered as a fixture.
8. Vents shall be connected to the discharge of each trap in the sanitary system, thence carried individually to a point above the flood level of the fixture before connecting with any other vent pipes. Pitch the branch vents back to the fixture.
9. Collect individual vent pipes together in branch vent lines and connect to vent stacks. Wherever possible, vent stack offsets shall be made with 45 degree fittings. The vents passing through the roof shall be a minimum size of four inches in diameter.
10. Cleanouts shall be provided in drainage piping at changes in directions, at foot of stacks or other required points accessible for cleaning or rodding out.
11. Cleanouts shall be of the same size as the pipe installed in up to four inches in diameter and not less than four inches in diameter for piping larger than four inches in diameter.
12. The maximum horizontal distance between cleanouts in piping four inches in diameter and smaller shall not be more than 50 feet apart. In piping five inches in diameter and larger, cleanouts shall not be more than 100 feet apart.
13. Traps on sanitary piping not integral with fixtures and in accessible locations shall be provided with a brass trap screw protected by the water seal, and will be regarded as a cleanout.
14. Test tees with brass cleanout plugs shall be provided at the foot of all vertical soil, waste and storm drainage stacks and at each floor. Wherever cleanouts on vertical lines occur concealed behind finished walls, they shall be extended to back of finished wall, and a wall plate shall be provided.

3.4 GENERAL INSTALLATION REQUIREMENTS

A. Piping Installation

1. Install piping approximately as shown on the drawings and as directed during installation by the Designer's representative.
2. Piping shall be installed as straight and direct as possible, forming right angles or parallel lines with building walls, other piping and be neatly spaced.
3. The horizontal runs of piping, except where concealed in partitions, shall be installed as high as possible.
4. Piping or other apparatus shall not be installed in such a manner as to interfere with the full swing of the doors and access to other equipment.
5. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the Drawings shall be followed as closely as possible.
6. It shall be possible to drain the water from all sections of each cold and hot water piping system. Pitch piping back to drain valves.
7. Screwed piping of brass or chrome plated brass shall be made up with special care to avoid marring or damaging pipe and fitting exterior and interior surfaces.

8. Small fittings shall be taper thread. Lampwick, cord, wool or any other similar material shall not be used to make up thread joints.
9. Screwed pipe and copper tubing shall be reamed smooth before installation.
10. All exposed piping in connection with fixtures shall be chrome plated. Where chrome plated piping is installed, cut and thread pipe so that no unplated pipe threads are visible when work is completed.
11. Reducing fittings, unless otherwise approved in special cases, shall be provided in making reduction in size of pipe. Bushings will not be allowed unless specifically approved.
12. Remove and replace with new materials, any copper or brass piping (chrome plated or unplated) showing visible tool marks.
13. Vertical risers shall be firmly supported by riser clamps, properly installed to relieve all weight from the fittings.
14. Any piece of pipe six inches or less in length shall be considered as a nipple.
15. All water service piping shall be kept a sufficient distance from other work to permit finished covering to be not less than 1.5 inches from other work and not less than 1.5 inches between the coverings (insulation) on the different services.
16. Grooved joint piping systems shall be installed in accordance with the manufacturer's (Victaulic or approved equal by Grinnell or Anvil Gruvlok) guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic or approved equal by Grinnell or Anvil Gruvlok. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic or approved equal by Grinnell or Anvil Gruvlok factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
17. Push-To-Connect Joints: Install in accordance with the manufacturer's latest recommendations. Follow the latest published literature as provided by Victaulic or approved equal by Grinnell or Anvil Gruvlok. Pipe ends shall be cleaned, free from indentations, projections, burrs, and foreign matter. Use a tube preparation tool as supplied by Victaulic or approved equal by Grinnell or Anvil Gruvlok to clean. Apply installation mark in accordance with Victaulic or approved equal by Grinnell or Anvil Gruvlok instructions. Push copper tube into fittings to installation depth mark, per Victaulic or approved equal by Grinnell or Anvil Gruvlok installation instructions. Keep fittings free of dirt and oil; use only on potable water or oil-free compressed air systems.

B. Hanger Installation

1. All piping shall be supported from the building structure by means of approved hangers and supports, to maintain proper grading and pitching of lines, to prevent vibration and to secure piping in place, and shall be so arranged as to provide for expansion and contraction.
 - a. Maximum spacing of hangers on soil pipe shall be five feet and hangers shall be provided at all changes in direction. Vertical hanger rods to support piping from the structure or supplementary steel shall not exceed four feet in total length. Where pipe support assemblies exceed four feet in total length vertically, this Contractor shall provide factory fabricated channels and all associated accessories.

- b. Friction clamps shall be installed at the base of the plumbing risers and at each floor (above or below floor slabs). Friction clamps installed above floor slabs shall not be supported from or rest on floor sleeves.
- c. Provide hangers at a maximum distance of two feet from all changes in direction (horizontal and vertical) and on both sides of concentrated loads independent of the piping.
- d. Hangers, in general, for all horizontal piping shall be Clevis type hangers. These hangers shall be sized to fit the outside diameter of the pipe insulation and insulation protectors (sheet metal shields) specified herein. For sprinkler/standpipe systems, hanger shall be approved black malleable iron, heavy duty pattern having two (2) parts bolted together.
- e. All vertical drops and runouts including insulated pipes shall be supported by split ring hangers with extension rods and wall plates. These hangers shall be copper plated when used on uncovered copper tubing. Supports on insulated vertical piping shall be sized to fit the outside diameter of the pipe insulation with 360 degrees insulation protector.
- f. Provide on each horizontal insulated lines, pipe covering protectors (shields) at each hanger. Each protector shall be sized to fit the outside diameter of the pipe insulation.
- g. Retaining straps shall be provided with all beam clamps.
- h. All supplementary steel, including factory fabricated channels, associated accessories, and 12 inch long sheet metal shields, throughout the project for this Section of the Specifications, both suspended and floor mounted, shall be provided by this Contractor and shall be subject to the approval of the Engineer.
- i. Hangers shall not pierce the insulation on any insulated pipe.
- j. Wire, tape or wood fastenings for shims or support of any pipe or tubing shall not be used.
- k. Remove all rust from the ferrous hanger equipment (hangers, rods, and bolts) and apply one coat of red lead immediately after erection.
- l. Piping at all equipment and each control valve shall be supported to prevent strains or distortions in the connected equipment and control valves. Piping at equipment shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional support after these items are removed.
- m. All piping shall be independently supported from the building structure and not from the piping, ductwork, conduit or ceiling suspension systems of other systems.
- n. Installation of hangers which permit wide lateral motions of any pipe will not be acceptable.
- o. "C" clamps installed with pipe hangers or equipment hangers will not be permitted unless provided with retaining straps.
- p. All no hub cast iron pipe 6 inches or larger in diameter shall be braced to prevent horizontal movement as recommended by the Cast Iron Soil Pipe Institute by using braces, blocking or rodding as illustrated in the CISPI Handbook, Vol. II, Specification Section 310.

C. Installation of Cleanouts and Ferrules

- 1. Riser Connection to Sewer or Drain: Where soil, waste, or roof drainage risers connect to a sewer or drain extending from the building above the lowest floor, the fitting at the base of each stack or downspout shall be a sanitary tee or a combination Y and 1/8 bend with cleanout plug in the end of the run of the main.
- 2. Test Tees: Each vertical soil, waste, and vent pipe and each downspout and roof drainage pipe which connects to horizontal drain piping below ground shall be fitted with

- a test tee above the lowest floor or ground. Where accessible, test tee may be installed in the horizontal pipe at the base of the riser.
3. Cover Plates: Where cleanouts or test tees occur on concealed pipes in finished rooms, they shall be provided with a 1/8 inch thick, machine finished, brass cover plate of sufficient diameter to cover the opening in the finished wall or partition. The cleanout plug shall have a solid head, tapped for a 1/4 inch brass screw to secure the cover plate. Where cleanout plugs extend beyond the wall finish, the cover plates shall be of machine finished brass and shall be only of sufficient depth to fit against the wall to cover plug. Cleanout cover plates shall be painted to match adjacent wall finish.
 4. Cleanouts Plugs For Threaded Fittings: Cleanout plugs for threaded fittings shall be in accordance with ANSI B16.12. Except for test openings, where size must be sufficient to admit test plug, bushings will be permitted on pipes 5 inches and larger to reduce plug size to 4 inches; cleanout plugs for piping 4 inches and smaller shall be the same size as the pipe.
 5. Cleanout Plugs For Hub and Spigot Fittings: Cleanout plugs for hub and spigot fittings shall be screwed into ferrules caulked into the fitting. Ferrules and plugs shall be in accordance with ANSI B16.12, except that plugs required to be flush with the floor shall have square countersunk heads in lieu of raised heads.
 6. Cleanout Plugs For Copper Drainage Lines: Cleanout plugs on copper drainage lines shall be installed in solder joint fittings having threaded openings provided for the cleanout, or in solder joint fittings with threaded adapters.

3.5 INSPECTION AND TESTS

A. General

1. All labor, materials, instruments, devices and power required for testing shall be provided by the Plumbing Subcontractor. The tests shall be performed in the presence and to the satisfaction of the Designer and Owner's Project Manager and such other parties as may have legal jurisdiction. No piping in any location shall be closed up, furred in, or covered before testing and approval by the State Plumbing Inspector and Owner's Project Manager.
2. Where portions of piping systems are to be covered or concealed before completion of the project, those portions shall be tested separately in the manner specified herein for the respective entire system.
3. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of Owner's Project Manager shall be retested in part or in whole as directed.
4. The Authority retains the right to request a recheck or resetting of any pump or instrument by the Plumbing Subcontractor during the guarantee period at no additional cost to the Contract or Owner.
5. Repair, or if directed by Designer or Owner's Project Manager, replace any defective work with new work without extra cost to Owner. Repeat tests as directed, until the work is proven to meet the requirements specified herein.
6. Restore to its finished condition any work, provided by other Contractors, damaged or disturbed by tests. The Plumbing Subcontractor shall engage the original Contractor to do the work of restoration to the damaged or disturbed work.
7. The fixtures shall be tested for stability of support and satisfactory operation. The piping shall be tested when directed by the Designer, State Plumbing Inspector or Owner's Project Manager for stability of support.
8. After the fixtures are set and connected, and the piping systems to same have been tested, the Plumbing Subcontractor shall turn water on to the fixtures, equipment, fill the traps, etc., and the proper operation of all items shall be demonstrated by him in the

presence of and to the satisfaction of the Designer, Owner's Project Manager, Plumbing Inspector, or their designated representative.

9. Caulking of screwed joints or holes in piping will not be acceptable.
10. The Plumbing Subcontractor shall notify the Designer, Owner's Project Manager and all inspectors having jurisdiction, a minimum of 48 hours in advance of making any required tests so that arrangements may be made for their presence to witness scheduled tests.

B. Specific

1. Storm and Sanitary Piping Systems:
 - a. Before the installation of fixtures, equipment and insulation, each system including vents shall have all necessary openings plugged to permit the entire system to be tested in accordance with the State Plumbing Code. Each system shall hold this water without a drop in water level. Test to be witnessed by the State Plumbing Inspector and Owner's Project Manager.
 - b. Where a portion of the system is to be tested, the test shall be accomplished with a vertical stack ten feet above the highest horizontal line to be tested may be installed, and filled with water to maintain sufficient pressure. A pump may be used to supply the required pressure. The pressure shall be maintained for a minimum of four hours for sufficient time to permit inspection of all joints.
2. Cold and Hot Water Piping System:
 - a. Upon completion of the roughing in and before setting fixtures and final connections to all equipment, all water piping systems shall be tested to a hydrostatic pressure of 150 pounds per square inch.
 - b. Each systems test shall be maintained for eight hours without a drop in pressure. These tests to be witnessed by the State Plumbing Inspector and Owner's Project Manager.
 - c. After testing, provide complete adjustment of all parts of each water system until design distribution or balancing is obtained throughout.

3.6 SPECIAL RESPONSIBILITIES

- A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.
1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
 2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
 3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
 4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections or by User Agency.
 5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Designer.
 6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor mounted vibrating and rotating equipment provided under this Section.

7. Notify Designer of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Designer, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non-functioning and abandoned piping, ductwork and equipment as directed by Designer. Dispose of or store items as requested by Designer.
- B. Installation Only Items
1. Where this contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for their unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:
 - a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
 - b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
 2. This Contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this contractor will be considered only if presented in writing within one week of their date of delivery. Unless such claims have been submitted this contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.
- C. Maintenance of equipment and systems: Maintain HVAC, Plumbing and Fire Protection equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.
- D. Use of premises: Use of premises shall be restricted as directed by Designer and as required below.
1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Designer and as specified under CLEANING article.
 2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.
 3. Do not interfere with function of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Designer as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Designer to provide minimal interference with normal operation. Obtain Designer's approval of the method proposed for minimizing service interruption.
- E. Surveys and measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
2. In event of discrepancy between actual measurements and those indicated, notify Designer in writing and do not proceed with work until written instructions have been issued by Designer.

3.7 MATERIALS AND WORKMANSHIP

- A. Work shall be neat and rectilinear. Piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe openings shall be temporarily closed to prevent obstruction and damage before completion.
- B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.
- C. References to manufacturers and to catalog designation, are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.
- D. Finish of materials, components and equipment shall be as approved by Designer and shall be resistant to corrosion and weather as necessary.
- E. Owner will not be responsible for material and equipment before testing and acceptance.

3.8 CONTINUITY OF SERVICES

- A. Do not interrupt existing services without Owner's Project Manager's approval.
- B. Schedule interruptions in advance, according to Owner's Project Manager's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.
- C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on User Agency's operations.

3.9 ANCHORS AND INSERTS

- A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.
- B. Provide anchors as necessary for attachment of equipment supports and hangars.

3.10 INSTALLATION OF EQUIPMENT

- A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Designer and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

- B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.
- C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.
- D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.
- E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.
- F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.
- G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Designer, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.11 PAINTING

- A. Equipment shall have shop coat of non-lead gray paint. Hangers and supports shall have one coat of non-lead red primer. Machinery such as pumps, fans, etc., shall be stenciled with equipment name. Stencil shall be at least 6 in. high for large equipment, 2 in. high for small equipment. Finish painting, including painting of various piping and duct systems, shall be done under other Sections.
- B. Note requirement for Designer's approval invoked under Part 3 article, MATERIALS AND WORKMANSHIP regarding finish of material and equipment which are visible or subject to corrosive or atmospheric conditions.
- C. Paint all existing and new gas piping on roof. Apply primer coat and final coat (gray).

3.12 CLEANING

- A. Piping
 1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
 2. Permanently install necessary chemical injection fittings complete with stop valves.
 3. After chilled water, heating hot water, condenser water, steam and condensate piping have been pressure tested and approved for tightness, clean and flush piping specified under WATER TREATMENT Paragraph.
 4. Maintain continuous blow down and make up, as required during flushing operation.
- B. Equipment
 1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.13 SYSTEM SHUTDOWNS

- A. Coordination shutdowns of existing systems with the Owner's Project Manager and submit a written request at least ten working days in advance. Minimize system shut downs as much as possible. Submit a list of all effected areas, the proposed work to be performed, and the expected length of the shut-down including time for retesting.
- B. Provide temporary services to maintain active system during extended shut-downs as required for demolition and construction phasing.

3.14 CORE DRILLING

- A. Do not core new concrete structure without written approval from the Structural Engineer.
- B. Perform all core drilling required for the proper installation of this Section. Locate all required openings and prior to coring. Coordinate the opening with the other Trades and obtain approval from the Structural Engineer.
- C. Thoroughly investigate the existing conditions in the vicinity of the required opening prior to cutting. Take care so as not to disturb the existing building systems. Damage to existing conditions incurred during core drilling shall be corrected to Owner's Project Manager's satisfaction with no additional expense to the Owner.

END OF SECTION

SECTION 230001

MECHANICAL

(TRADE - BID REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 01 - GENERAL REQUIREMENTS shall be included in, and made a part of this Section.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.
- C. Reference Drawings: The work of this Trade Bid is shown on the following Contract Drawings:

Mechanical Drawings: M0.00 – MECHANICAL LEGEND, NOTED AND ABBREVIATIONS
M0.01 – BASEMENT LEVEL MECHANICAL PLAN
M0.02 – ROOF MECHAICAL PLAN

- 1. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section. The listing of Contract Drawings above does not limit Filed Subcontractor's responsibility to determine full extent of work of this Section as required by all Drawings listed in the Drawing List on the Drawing Title Sheet, as modified by Addenda.
 - 2. Refer to Section 012300 - ALTERNATES, for alternates that may affect the scope of Work of this Section.
- D. Sub-Bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in Invitation to Bid and Instructions to Bidders.
- 1. The following shall appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: _____
SUB-BID FOR TRADE: Mechanical
 - 2. Each Sub-Bid submittal for work under this Section shall be on forms furnished by Awarding Authority, as bound herein, accompanied with the required bid deposit in compliance with MGL c149, Section 44B in the amount of 5 percent of Filed Sub-Bid.
- E. Sub Sub-Bid Requirements: In accordance with Massachusetts General Law, Chapter 149, Section 44F, as amended, The Filed Sub-Bidder shall list in "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that Sub-Trade require such listing.
- 1. This filed trade requires that the following classes of work be listed in under the conditions indicated herein.
 - a. Insulation

2. If the sub-bidder intends to use sub-trade subcontractors to perform any portion of the trade work other than the customary sub-trade classes of work listed above, the sub-bidder shall list on the bid form the names of each such sub-trade subcontractor and each respective sub-trade subcontract sum unless: a) the value of the sub-trade subcontract is less than Ten Thousand Dollars (\$10,000), or b) the sub-trade subcontract is not subject to the provisions of G.L. c. 149, §§ 44A-J.

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. Section 230100 - Basic Mechanical Requirements
 2. Section 231400 - Supports and Anchors
 3. Section 231900 - Mechanical identification
 4. Section 232600 - Piping Insulation
 5. Section 235200 - Steam and Steam Condensate Piping

1.3 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor or Filed Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.
- B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to Invitation to Bid for time and date.

END OF SECTION

SECTION 230100

BASIC MECHANICAL REQUIREMENTS

(TRADE CONTRACT REQUIRED AS PART OF SECTION 230001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 230001 - Mechanical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 230001.

1.2 WORK INCLUDED

- A. Basic Mechanical Requirements specifically applicable to Division 23 Sections, in addition to Division 01 – General Requirements.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 Specification sections, apply to work of this Section.
- B. All related Specification sections shall be used in conjunction with this Section.

1.4 WORK

- A. Demolition: For demolition requirements, refer to Demolition Drawings.
- B. New Work: Scope of work includes furnishing and installing equipment, other apparatus and accessories required for complete mechanical systems. This project includes both renovation and new construction.

1.5 MECHANICAL CONTRACT DOCUMENTS

- A. Should the Contract Documents disagree within themselves or with each other, the Contractor shall provide the better quality or greater quantity of work and/or materials, unless specifically otherwise directed by written Addendum to the Contract.

1.6 SUBMITTALS

- A. Refer to Division 01 for submittal requirements. The following paragraphs supplement the requirements of Division 01.
- B. Submit shop drawings and product data as requested by other Division 23 sections. All submittals to follow requirements of General Conditions, modifications to General Conditions and Division 01.

- C. The Contractor will be held responsible for checking and verifying all field measurements, and shall submit promptly, as to cause no delay in any work, shop drawings and schedules required for the work. The Contractor shall check and approve all submittals before forwarding to the Architect. All submittals shall be transmitted to the Architect using the submittal transmittal form contained in Division 01. The Architect will forward submittals to the Engineer. The Engineer will check and review the submittals with reasonable promptness, but only for conformance with design concept of the project and for compliance with information given in Contract Documents. The Contractor shall make any corrections required by the Engineer. The Engineer's review of submittals shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications, unless he has, in writing, called the Engineer's attention to such deviations at the time of submission and has secured the Engineer's written approval. Additionally, the Engineer's review of submittals shall not relieve the Contractor from responsibility for any errors or omissions contained in the submittals.
- D. When necessary, shop and setting drawings shall be based upon actual measurements taken at the site and upon other job conditions. Show any variations and revisions to Drawings or Specifications that are necessary for proper installation.
- E. Submit copies of manufacturer's shop drawings showing illustrated cuts of item to be furnished, scale details, sizes, dimensions, performance characteristics, capacities, installation instructions, wiring diagrams and controls and all pertinent information.
- F. At completion of construction, the Contractor shall furnish the Owner with one (1) unused copy of all reviewed shop drawings, manufacturer's diagrams, installation instructions, literature, etc., that were used in execution of the work.
- G. The Contractor shall note that where more than one manufacturer's name is listed for the various major items of equipment and materials specified herein, the plans and specifications have been developed on the basis of equipment as manufactured by the first manufacturer name. Other manufacturers names are included to indicate the equipment manufactured by them may be considered acceptable for this project, provided that the equipment meets all requirements as to quality, size, and adaptability to space requirements, etc. It shall be the Contractor's responsibility to assure that the equipment, as manufactured by other than the first name manufacturer, shall meet all requirements as to quality, size, capacity, function, adaptability to space requirements, etc. The Engineer's review of shop drawings for equipment as manufactured by other than the first named manufacturer shall in no way relieve the Contractor of this responsibility.

1.7 SUBSTITUTIONS

- A. Any and all proposed substitutions must be approved by the Engineer during the bid phase and must be indicated on the form of proposal.

1.8 COORDINATION

- A. Coordinate with all other trades as required throughout the project.

1.9 REGULATORY REQUIREMENTS

- A. Building Codes: Conform to Massachusetts State Building Code (CMR 780), 8th Edition, and 2015 International Building Code (2015 IBC).
- B. Fire Prevention Regulations: Conform to the Massachusetts Fire Prevention Regulations M.G.L Chapter 148 Section 26G – Sprinkler Protection (CMR 527).

- C. Mechanical Codes: Conform to 2015 International Mechanical Code (2015 IMC).
- D. Plumbing: Conform to Massachusetts State Plumbing Code (CMR 248).
- E. Energy Conservation: Conform to the 2015 International Energy Conservation Code (2015 IECC).
- F. Obtain ALL permits and approvals, and request ALL inspections from the authority having jurisdiction, in a timely manner.
- G. As required by State Law or local ordinance, all contractors, installers and technicians shall be duly licensed and qualified for the trades and tasks they are to perform.
- H. Submit appropriate close-out documentation to the authority having jurisdiction at the conclusion of the project.
 - 1. Submit Start-Up Test Reports and Statements of Satisfactory Operation for systems to the authority having jurisdiction at the conclusion of the project.

1.10 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on the Drawings, unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of Architect before proceeding.

1.11 RECORD DOCUMENTS

- A. Refer to Division 01 for record document requirements. The following paragraphs supplement the requirements of Division 01.
- B. Mark drawings to indicate revisions to piping and ductwork (size and location), both exterior and interior. Include locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair. Show actual equipment locations dimensioned from column lines, actual inverts and locations of underground piping, concealed equipment dimensioned to column lines, locations of mains and branches of piping systems, numbered valves and control devices, concealed unions, items requiring maintenance (i.e., traps, strainers, expansion compensators, tanks, air vents, etc.), and control system devices. Mark all change orders on the drawings.
- C. Mark specifications to indicate approved substitutions, change orders, and actual equipment and materials used.

1.12 OPERATION AND MAINTENANCE DATA

- A. Refer to Division 01 for operation and maintenance manual requirements. The following paragraphs supplement the requirements of Division 01.
- B. The Contractor shall provide the following information in a bound manual:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 4. Servicing instructions and lubrication charts and schedules.
- C. Two (2) copies of operations and maintenance data shall be submitted to the Architect for review: one (1) copy shall be returned to the Contractor (with any instructions for changes). After implementing any changes, five (5) copies of instructions covering all equipment shall be furnished to the Architect who will forward two (2) copies to the Owner for his information and use.
- D. Append to manual, the name, address and telephone number of the Contractors and Subcontractors and for mechanical items, provide the name, address and telephone number of companies servicing installed equipment on a 24-hour basis.

1.13 PRODUCTS

- A. When two or more items of same material or equipment are required (plumbing fixtures, pumps, valves, air handling units, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flange types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in work, except as otherwise indicated.
- B. Provide products which are compatible within systems and other connected items.

1.14 NAMEPLATE DATA

- A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.15 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to project properly packaged and protected to prevent damage during shipment, storage, and handling.
- B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.
- C. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.16 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Note that where access is required through general construction elements, the Mechanical Contractor is to furnish all required access doors for access to mechanical equipment, and is to coordinate with the General Contractor regarding

access door locations and installations. Access doors furnished shall comply with Section 083500. Allow ample space for removal of all parts that require replacement or servicing.

- B. Extend all grease fittings to an accessible location.

1.17 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 02 through 26 for rough-in requirements.

1.18 MECHANICAL INSTALLATIONS

- A. Coordinate mechanical equipment and materials installation with other building components.
- B. Verify all dimensions by field measurements.
- C. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
- E. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- F. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
- G. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.
- H. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- I. Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations.
- J. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.19 CLEANING

- A. Refer to Division 01 for general requirements for final cleaning.

1.20 ASBESTOS REMOVAL

- A. Asbestos removal is not a part of this project. Should this Contractor or any of its Subcontractors encounter any suspect asbestos containing material or products during the

performance of its work, stop work immediately and so inform the General Contractor, the Owner, and the Architect so that testing and proper action may be taken.

1.21 WARRANTIES

- A. Refer to Division 01 for warranty requirements. The following paragraphs supplement the requirements of Division 01.
- B. Compile and assemble all warranties for equipment specified in Division 23 into vinyl-covered three-ring binders, tabulated and indexed for easy reference.
- C. Provide complete warranty information for each item. Include product or equipment, date of beginning of warranty or bond, duration of warranty or bond, and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.22 GUARANTEE

- A. The Contractor shall guarantee all work to be free from defects for a period of one (1) year after acceptance. Any and all work found defective or not in accordance with the Contract during this period shall be corrected promptly by the Contractor after written notification from the Owner. The Contractor shall repair or correct the work within ten (10) days of the written notification and if the Contractor does not comply, the Owner may have the work corrected and charge all such work to the Contractor.

1.23 AUTOCAD FILES

- A. Following the receipt of a written request from the Contractor, RFS will furnish AutoCAD electronic files for mechanical drawings. Signing of the Rist-Frost-Shumway Engineering, P.C. Electronic Document File/Digital License Agreement shall be considered prerequisite for the release of the files.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

SECTION 231400

SUPPORTS AND ANCHORS

(TRADE CONTRACT REQUIRED AS PART OF SECTION 230001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 230001 - Mechanical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 230001.

1.2 SECTION INCLUDES

- A. Pipe and equipment hangers, supports, and associated anchors.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 Specification sections, apply to work of this Section.
- B. All related Specification sections shall be used in conjunction with this Section.

1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 230100.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PIPE HANGERS AND SUPPORTS

- A. Anvil International
- B. Carpenter & Paterson
- C. Grinnell

2.2 PIPE HANGERS AND SUPPORTS

- A. Hangers for all insulated pipes shall be sized and installed so they are outside the insulation jacket.

- B. Hangers for Pipe Sizes 1/2 to 1-1/2-Inch: Carbon steel, adjustable swivel, ring type or adjustable, clevis.
- C. Hangers for Pipe Sizes 2 to 4-Inches: Carbon steel, adjustable, clevis.
- D. Hangers for Pipe Sizes 5-Inches and Over: Adjustable steel yoke, cast iron roll, double rod roll hanger or pipe stand.
- E. Wall Support for Pipe Sizes 4-Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 5-inches and over.
- F. Vertical Support: Steel riser clamp. Provide sheet lead inserts for all copper pipe risers.
- G. Floor Support for Pipe Sizes to 4-Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.
- H. Floor Support for Hot Pipe Sizes 5-Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- I. Shields for Insulated Pipes Installed with Ring Type or Clevis Type Hangers: Galvanized steel shields over insulation in 180° segments. For pipe sizes 3-inches and smaller, shield shall be 18-gauge minimum and minimum 6-inches long. For pipes sizes over 3-inches, shield shall be 16-gauge minimum and a minimum of 12-inches long.
- J. Saddles for all Insulated Pipes Installed with Roll Type Hangers: Pipe covering protective saddles which shall be a minimum of 12-inches long and shall be of the same thickness as the insulation thickness. Saddles for hot pipes shall be carbon or alloy steel. Saddles for cold pipes shall be hard block non-conducting type.

2.3 PIPING GUIDES

- A. Piping guides for above ambient fluids may be either pre-insulated or field insulated spider-housing design to provide positive pipe alignment.

2.4 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.5 INSERTS

- A. Inserts: Carbon steel flat bar type or malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.6 C-CLAMPS

- A. C-Clamps: Malleable iron clamp; hardened steel cup point set screw and locknut; size c-clamps to suit threaded hanger rod.

2.7 EQUIPMENT BASES AND SUPPORTS

- A. All equipment bases and supports to be located in areas subject to corrosion shall be constructed of hot-dipped galvanized steel. In addition, use galvanizing paint on all cut ends, nuts and threads after installation.

- B. Steel Equipment Bases and Supports: Fabricate from structural steel members to suit the equipment supports. Conform to manufacturer's recommendations where applicable.
- C. Concrete Equipment Bases: To be installed under Section 03300. Coordinate with appropriate Subcontractor as required.

2.8 FLASHING

- A. Metal Flashing: 26-gauge galvanized steel.
- B. Lead Flashing: 5 lb./sq. ft. sheet lead for waterproofing; 1 lb./sq. ft. sheet lead for soundproofing.
- C. Flexible Flashing: 47-mil thick sheet butyl; compatible with roofing.
- D. Caps: Steel, 22-gauge minimum; 16-gauge at fire-resistant elements.

2.9 SLEEVES

- A. Size sleeves large enough to allow for continuous insulation wrapping and to allow for movement due to expansion and contraction.
- B. Sleeves for Pipes Through Non-Fire Rated Floors: Form with 18-gauge galvanized steel.
- C. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18-gauge galvanized steel.
- D. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.

2.10 FINISH

- A. All hangers, supports, guides, anchors, and installation hardware shall be hot-dipped galvanized or stainless steel.

PART 3 – EXECUTION

3.1 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as follows:

Pipe Size	Maximum Hanger Spacing	Hanger Diameter
1/2 to 1-1/4-inch	6'-6"	3/8"
1-1/2 to 2-inch	10'-0"	3/8"
2-1/2 to 3-inch	10'-0"	1/2"
4 to 6-inch	10'-0"	5/8"

- B. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
- C. Place a hanger within 12-inches of each horizontal elbow.

- D. Use hangers with 1-1/2-inch minimum vertical adjustment.
- E. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Support riser piping independently of connected horizontal piping.
- H. Provide rigid anchors for pipes where vibration isolation components are installed.

3.2 DUCTWORK HANGERS AND SUPPORTS

- A. Install ductwork hangers and supports in accordance with "HVAC Duct Construction Standards" (second edition) as published by SMACNA.

3.3 HANGER RODS

- A. All hanger rods shall be hung from C-clamps on steel beams or bar joists, from inserts in concrete, or from coach screw threaded rods in wood construction.
- B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4-inches and for multiple or trapeze hangers carrying any pipe over 3-inches.

3.4 EQUIPMENT BASES AND SUPPORTS

- A. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment to Subcontractor responsible for concrete equipment bases.
- B. Construct steel bases and supports of structural steel members. Conform to the latest edition of Standard Specifications for Buildings and Bridges of the American Society for Testing Materials.

3.5 FLASHING

- A. Where piping and ductwork penetrate weatherproofed or waterproofed walls, floors, and roofs and where the installation of roof curbs is required, coordinate installation of vapor barrier and flashing with Construction Manager.
- B. Flash plumbing vent pipes projecting 3-inches minimum above finished roof surface with lead worked one inch minimum into hub, 8-inches minimum clear on sides with 24 x 24-inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash and seal.
- C. Flash floor drains in floors with topping over finished areas with membrane flashing; 10-inches clear on sides with minimum 36 x 36-inch sheet size. Fasten flashing to drain clamp device.
- D. Seal floor, shower, and mop sink drains watertight to adjacent materials.
- E. Provide flashing for curbs for mechanical roof installations. Flexible sheet flash and counterflash with sheet metal; seal watertight.

3.6 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Extend sleeves through floors one inch above finished floor level. Caulk seal sleeves full depth and provide floor plate.
- C. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping or stuffing insulation (as required based on wall type) and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of duct penetrations.
- D. Install chrome plated steel escutcheons at finished surfaces.

END OF SECTION

SECTION 231900

MECHANICAL IDENTIFICATION

(TRADE CONTRACT REQUIRED AS PART OF SECTION 230001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 230001 - Mechanical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.

- 1. Work of this Trade Contract includes all individual specifications sections listed in Section 230001.

1.2 WORK INCLUDED

- A. Identification of mechanical products installed under Division 23.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 Specification sections, apply to work of this Section.
- B. All related Specification sections shall be used in conjunction with this Section.

1.4 SUBMITTALS

- A. Submit product data under provisions of Section 230100.
- B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Seton
- B. National
- C. Ideal

2.2 MATERIALS

- A. Color: Unless specified otherwise, conform to ANSI/ASME A13.1.

- B. Metal Tags: Brass with stamped letters and numerals; tag size minimum 1½-inch diameter with smooth edges.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- A. Metal Tags: Install with corrosive-resistant chain.
- B. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- C. Piping: Identify all new piping and all existing piping to remain, concealed or exposed, with plastic pipe markers. Clearly identify flow direction, and fluid being conveyed. Install in clear view and align with axis of piping. Locate identification not to exceed 30-feet on straight runs including risers and drops, adjacent to each valve and "T," at each side of penetrations of the structure or enclosure, and at each obstruction.

3.3 VALVE TAGS AND LISTS

- A. Provide on all valves installed under this Section a 1½-inch diameter metal tag. The tags shall be attached to the valve handle or stem with brass chains and properly secured. All valve tag numbers shall be prefixed by letters corresponding to the media in the piping system.
- B. The valve numbers shall correspond with numbers indicated for valves and controls on the Record Drawings and on a minimum of two (2) printed valve lists. These printed lists shall state the tag number and location of each valve and the section, fixture or equipment which it controls, and other necessary information, such as requiring the opening or closing of another valve where one valve is to be opened or closed.
- C. Printed lists shall be prepared in a form to meet the approval of the Architect, framed under glass and displayed in rooms designated by the Architect.

END OF SECTION

SECTION 232600

PIPING INSULATION

(TRADE CONTRACT REQUIRED AS PART OF SECTION 230001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 230001 - Mechanical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 230001.

1.2 WORK INCLUDED

- A. Piping insulation.
- B. Jackets and accessories.
- C. Removable insulation covers.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 Specification sections, apply to work of this Section.
- B. All related Specification sections shall be used in conjunction with this Section.

1.4 QUALITY ASSURANCE

- A. Applicator: Company specializing in piping insulation application with three years' minimum experience.
- B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, and UL 723.

1.5 SUBMITTALS

- A. Submit product data under provisions of Section 230100.
- B. Include product description, list of materials, and thickness for each service.
- C. Submit manufacturer's installation instructions.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - ABOVE GROUND INSULATION

- A. Aerogel
- B. Approved Equal

2.2 INSULATION

- A. Type A: Pyrogel XT insulation "K" value of 0.19 at 200 deg. F

2.3 JACKETS

- A. Interior Applications:
 - 1. Non-vapor barrier jackets: All service type with self-sealing adhesive joints.
 - 2. PVC jackets: One-piece, pre-molded type.
 - 3. Valves up to 3": - PVC Jackets. Valves over 3" size – Removable Insulation Covers.

2.4 ACCESSORIES

- A. Insulation Bands: 3/4-inch wide; 0.015-inch thick galvanized steel.
- B. Adhesives: Compatible with insulation.

2.5 ACCEPTABLE MANUFACTURERS - REMOVABLE/REUSABLE INSULATION COVERS

- A. Ohio Valley Industrial Services
- B. O'Brien Corporation
- C. Hitco Company

2.6 REMOVABLE/REUSABLE INSULATION COVERS

- A. Removable/reusable insulation covers described in this specification will be used on the following equipment.
 - 1. Steam traps.
- B. General Requirements:
 - 1. The Engineer shall review any deviations from this specification prior to the fabrication of the covers.
 - 2. The insulation fabricator shall field measure all items requiring flexible removable insulation covers, and maintain measure up drawings of these items.
 - 3. The fabricator shall provide technical assistance during post start-up installation of completed covers or until covers are installed and accepted.
 - 4. Reusable insulation covers are considered to be custom built and will be fabricated to conform to the allowances for valve bonnet height, gland openings, protrusions, etc.
 - 5. No force folding or bending of covers will be acceptable, and no "One Size Fits All" cover design will be allowed.
 - 6. The covers will be fabricated with the parting faces at the installed cover low point to allow for drainage and facilitate flange leakage detection.
- C. Materials:
 - 1. Jacking material: The inside liner and outside jacketing material shall consist of a 17 oz. per square yard fiberglass cloth impregnated with PTFE Teflon. This material shall have a continuous temperature rating of 500 deg. F.

2. Insulation: 2-1/2" of SR-26 fibrous glass bounded with a thermo setting resin. The insulation will have temperature rating of 1,000 deg. F.
3. Sewing thread: Spun Kevlar or E-24 fiberglass thread coated with Teflon.
4. Velcro fastening: Velcro fastening for securement of flaps shall be heat resistant Nomex material.
5. Tie-down/anchor straps: Straps shall be fabricated from 17 oz. per square yard fiberglass cloth impregnated with RTFE Teflon. Tie-down/anchor straps shall incorporate 304 stainless steel D rings.

D. Fabrication:

1. Seams: All seams must be machine sewn with specified thread. Sewing will be double straight stitched with 2 parallel rows of 6 to 8 stitches per inch. "Hog-ringed" seams are not acceptable.
2. Construction: Covers are to be constructed inside-out and turned outside out before filling with insulation. All seams are to be inside seams except for the closing seam which is to be double top stitched.
3. All covers must overlap the existing insulation a minimum of 3-inches unless otherwise directed by the Engineer.
4. Identification: All removable/reusable insulation covers shall have a stainless steel or equivalent identification tag permanently attached to the outside jacketing of the cover. The tag shall contain adequate information to locate the component for which the cover was designed. The tag shall also list the manufacturer of the cover.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Install materials after piping has been tested and approved.

3.2 INSTALLATION - ABOVE GROUND INSULATION

- A. Install materials in accordance with manufacturer's instructions. Should this project include the use of any mechanical coupling type piping systems, all insulation products provided under this Section shall be compatible with such systems.
- B. Continue insulation through penetrations.
- C. On exposed piping, locate insulation and cover seams in least visible locations.
- D. On insulated piping without vapor barrier and piping conveying fluids 140 deg. F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation at such locations.
- E. Neatly finish insulation at supports, protrusions, and interruptions.
- F. Jackets:
1. Indoor, concealed applications: Insulated pipes conveying fluids above ambient temperature shall have standard jackets, factory-applied or field-applied. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with PVC fitting covers. Follow manufacturer's instructions.
 2. Indoor, exposed applications (PVC jacketed): For piping exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications, except

also use an additional PVC jacketed system to cover all piping 1) within the finished space or 2) to a height of 7' above finished floor. In addition, use PVC tape on all joints (no tacks).

Note: For existing piping to remain, where existing insulation is disturbed in order to alter existing piping systems, or for any other reason, patch disturbed insulation to match existing undisturbed insulation.

3.3 SCHEDULE – ABOVE GROUND PIPING INSULATION

Piping Type	Insulation Type	Insulation Thickness (in inches) for Various Pipe Sizes				
		1" and less	1¼" to 1½"	2"	2½" to 4"	5" and Greater
Steam - High Pressure	A	2"	2"	2"	2"	2"
Steam Condensate	A	1"	1"	1.5"	1.5"	1.5"

3.4 INSTALLATION - REMOVABLE INSULATION COVERS

- A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 235200

STEAM AND STEAM CONDENSATE PIPING

(TRADE CONTRACT REQUIRED AS PART OF SECTION 230001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 230001 - Mechanical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 230001.

1.2 WORK INCLUDED

- A. Steam Piping
- B. Steam Condensate Piping
- C. Fittings
- D. Gate Valves
- E. Ball Valves
- F. Check Valves
- G. Strainers

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to work of this Section.
- B. All related Specification sections shall be used in conjunction with this Section.

1.4 SPECIAL COORDINATION

- A. Before beginning any work, the Contractor shall study the Drawings and visit the site to become thoroughly familiar with all details of the work and working conditions, and to verify all dimensions in the field. The Engineer shall be informed of any discrepancy before commencing with the work. The Contractor shall be responsible specifically for the coordination and proper relation of his work to the existing building structures, and existing work on site.
- B. Provide test pits where indicated and as necessary to verify the depths of existing utilities.
- C. Protect the work sites, surrounding areas, and occupants from damage or injury during the execution of the work. The Contractor shall take the necessary precautions to prevent injury of

workers, Plymouth State University's personnel, or passersby at all times. It is the Contractor's responsibility to determine the nature of these requirements and provide the proper level of protection.

- D. Coordinate all work through the Construction Manager.
- E. The Contractor shall physically examine all materials/items for conformance to specifications. Permanently remove nonconforming items from the work site.
- F. Remove all debris from the work site and dispose of in a proper manner according to local, state, and federal codes.

1.5 QUALITY ASSURANCE

- A. ASME Compliance: Fabricate and install steam and condensate piping in accordance with ASME B.31.9 "Building Services Piping" and B.31.1 "Power Piping".
- B. Qualify welding procedures, welders, and operators in accordance with ASME B31.9 and B31.1, as applicable for shop and project site welding of piping work.
- C. Notify Owner's Representative twenty-four (24) hours in advance of tests and backfilling.

1.6 SUBMITTALS

- A. Submit shop drawings, product data, operation and maintenance manuals, record drawings, and warranties under provisions of Section 230100.
- B. Submit one copy of welder's certification document.
- C. Submit the following for the underground steam and condensate system:
 - 1. All items listed under paragraph 1.01 - Work Included.

1.7 DELIVERY AND STORAGE

- A. After delivery to the job site, all materials and equipment shall be protected from anything which could cause damage to the material or equipment. All pipes shall be sealed at each end to keep the interior clean and free of dirt and debris. Fittings shall be kept together and their interior surfaces shall remain clean. Insulation shall be kept dry and clean.

PART 2 – PRODUCTS

2.1 HIGH PRESSURE STEAM PIPING 15-100 psig

- A. Steel pipe: Schedule 40 seamless, carbon steel, ASTM A106 Grade B or A53 Grade B ERW.

2.2 STEAM CONDENSATE PIPING

- A. Steel Pipe: Schedule 80 seamless, carbon steel, ASTM A106 Grade B or A53 Grade B ERW.

2.3 FITTINGS

- A. Screwed: 300 lb. malleable iron. (2" and smaller)

- B. Flanged: with flexitallic gaskets (2-1/2" and larger)
 - 1. 150 lb. forged steel, welded neck, raised or flat face as applicable for up to 100 PSIG maximum operating pressure.
- C. Welded: Buttwelded, wrought carbon steel, schedule not less than adjacent pipe.
- D. Unions: Screwed through 2", 250 lb SWP with brass-to-brass seats.

2.4 ACCEPTABLE MANUFACTURERS - GATE VALVES

- A. Nibco
- B. Milwaukee
- C. Crane

2.5 GATE VALVES

- A. 2" and Smaller: For up to 150 PSI maximum 366 deg. F saturated steam: 150lb. SWP, all bronze, non-rising stem, screwed bonnet, one-piece wedge, designed to permit repacking under pressure, threaded. (Nibco T-133 or equal)

2.6 ACCEPTABLE MANUFACTURERS - BALL VALVES

- A. Nibco
- B. Apollo
- C. Worcester Ball Valve

2.7 BALL VALVES

- A. 2" and smaller: Carbon Steel three-piece body, full port, blowout proof stem, 316 SS Trim, Nibco threaded equal to T-595 or equal.
 - 1. Provide stem extension suitable to allow for insulation of valve body without interfering with valve handle operation.

2.8 ACCEPTABLE MANUFACTURERS - CHECK VALVES

- A. Nibco
- B. Apollo
- C. Watson McDaniel

2.9 CHECK VALVES

- A. 2" and smaller: For up to 150 PSI maximum 366 deg. F saturated steam: 150 lb. SWP, all bronze, horizontal swing-type, screwed caps, bronze disk, designed to allow regrinding of seat without removal of valve body. Solder or threaded ends as applicable. (Nibco T-433 or equal)

2.10 ACCEPTABLE MANUFACTURERS - STRAINERS

- A. Watson McDaniel
- B. Spirax-Sarco
- C. Armstrong

2.11 STRAINERS

- A. 2" and smaller: Iron body, "Y" pattern with 1/32-inch stainless steel perforated screen. (Watson McDaniel WCIY or equal)
- B. Provide ball type, blow-down valve on all strainer cleanouts.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges.
- D. After completion, clean and treat systems. Refer to Section 235450.

3.2 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- B. Install piping to conserve building space and not interfere with use of space, other work, or equipment.
- C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide clearance for installation of insulation and access to valves and fittings.
- E. Provide access where valves and fittings are not exposed.
- F. Slope steam piping one inch in 40 feet (0.25 percent) in direction of flow, except where indicated otherwise. Use eccentric reducers to maintain bottom of pipe level.
- G. Slope steam condensate piping one inch in 40 feet (0.25 percent). Provide drip trap assembly at low points and before control valves.
- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- I. Install valves with stems upright or horizontal, not inverted.
- J. Install pipe sleeves and elastomeric seals where steam and condensate piping penetrate through exterior foundation walls.

3.3 WELDING

- A. Weld only by approved acetylene or electric welding processes and welders shall hold certificate from approved insurance company.
- B. Conduct test to demonstrate suitability of procedures to be used in making welds which conform to specified requirements.
- C. Specification for welding procedure shall meet requirements of Welding Qualifications, Section IX, ASME Boiler and Pressure Vessel Code and ANSI B31.1.
- D. Align components. No strain shall be placed on weld during welding. No part of pipe shall be offset more than 20% of thickness. Set flanges and branches properly.
- E. Welder Qualification:
 - 1. Test welders to demonstrate ability to make acceptable welds. Tests conducted for qualification of welder for work under one Division or Section shall not qualify welder for work under another Division or Section.
 - 2. Tests shall be as prescribed for welder qualification in Section IX of the ASME code.
 - 3. Records of such tests shall be as follows: Each welder shall be assigned an identifying number, letter or symbol. Identifying mark shall be stamped adjacent to welds made by this welder. Identification shall be at top of horizontal piping and at front of vertical piping.
 - 4. Maintain record of welders employed, showing dates and results of tests and identifying mark assigned to each welder. Certify records and make them accessible to Owner's project representative and/or project manager. Before completion of project, one copy of records shall be turned over to Owner.
 - 5. No qualification shall be older than three years when welder commences work on this project. If welder has not welded in required welding process for a period of six months, he shall be re-certified.
- F. Welding Tests:
 - 1. As designated by Engineer, remove welds for destructive testing or for testing by non-destructive means. Tests shall be determined by Engineer.
 - 2. If in Engineer's opinion, welds so tests do not meet requirements of Sections VIII and IX or ASME, then the Contractor shall pay for costs of the tests. Remove welds welded by that welder, at no cost to the Owner. Re-welding shall be performed by qualified welder other than welder whose welds did not pass test. Welders, whose welds were defective, shall not be employed on site for remainder of project.
 - 3. Welding of stanchions, brackets, anchors and other welding not performed on pipe joints shall be in accordance with requirements of AWS specifications and requirements.

3.4 PIPING TESTS

- A. Test pressure piping in accordance with ASME B31.
- B. General:
 - 1. Provide temporary equipment for testing, including pump and gauges. Test piping system before insulation is installed wherever feasible. Test each section of piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.

2. Required test period is 2-hours, minimum.
 3. Test long runs of pipe at 125 psi, or one and one-half times the operating pressure, whichever is greater. Observe each test section for leakage at end of test period. Test fails if leakage is observed.
- C. Repair piping systems sections which fail required piping test, by disassembly and reinstallation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- D. Drain test water from piping systems after testing and repair work has been completed.
- E. Cleaning, Flushing, Inspecting: Clean exterior surfaces of installed piping systems of superfluous materials. Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports, and accessory items. Inspect pressure piping in accordance with procedures of ASME B31.

END OF SECTION

SECTION 260001

ELECTRICAL

(TRADE BID REQUIRED)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 01 - GENERAL REQUIREMENTS shall be included in, and made a part of this Section.

B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.

C. Reference Drawings: The work of this Trade Bid is shown on the following Contract Drawings:

- Electrical Drawings:
- E0.00 ELECTRICAL LEGEND, NOTES AND ABBREVIATIONS
 - E1.01 FIRST FLOOR BATHROOM ELECTRICAL PLAN
 - E1.02 FIFTH FLOOR & ROOF ELECTRICAL PLAN
 - E1.03 PENTHOUSE HIGH ROOF & OBSERVATORY ELECTRICAL PLAN
 - E1.04 THIRD FLOOR & FOURTH FLOOR ELECTRICAL PLAN
 - E2.01 LIGHTING FIXTURE SCHEDULE & DETAILS
 - E3.01 ELECTRICAL DETAILS

1. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section. The listing of Contract Drawings above does not limit Filed Subcontractor's responsibility to determine full extent of work of this Section as required by all Drawings listed in the Drawing List on the Drawing Title Sheet, as modified by Addenda.
2. Refer to Section 012300 - ALTERNATES, for alternates that may affect the scope of Work of this Section.

D. Sub-Bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in Invitation to Bid and Instructions to Bidders.

1. The following shall appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: _____
SUB-BID FOR TRADE: Electrical

2. Each Sub-Bid submittal for work under this Section shall be on forms furnished by Awarding Authority, as bound herein, accompanied with the required bid deposit in compliance with MGL c149, Section 44B in the amount of 5 percent of Filed Sub-Bid.

E. Sub Sub-Bid Requirements: In accordance with Massachusetts General Law, Chapter 149, Section 44F, as amended, The Filed Sub-Bidder shall list in "Form for Sub-Bids" the name and

bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that Sub-Trade require such listing.

1. This filed trade requires that the following classes of work be listed in under the conditions indicated herein.
 - a. Insulation
2. If the sub-bidder intends to use sub-trade subcontractors to perform any portion of the trade work other than the customary sub-trade classes of work listed above, the sub-bidder shall list on the bid form the names of each such sub-trade subcontractor and each respective sub-trade subcontract sum unless: a) the value of the sub- trade subcontract is less than Ten Thousand Dollars (\$10,000), or b) the sub-trade subcontract is not subject to the provisions of G.L. c. 149, §§ 44A-J.

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. Section 260100 - Basic Electrical Requirements
 2. Section 260600 - Grounding and Bonding
 3. Section 260700 - Supporting Devices
 4. Section 260750 - Electrical Identification
 5. Section 260800 - Electrical Testing
 6. Section 261200 - Conductors and Cables
 7. Section 261300 - Raceways
 8. Section 261370 - Outlet Boxes and Enclosures
 9. Section 261400 - Wiring Devices
 10. Section 261500 - Electrical Connections
 11. Section 264110 - Circuit Breakers in Existing metal
 12. Section 265100 - Lighting
 13. Section 267200 - Fire Alarm System

1.3 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor or Filed Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.
- B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to Invitation to Bid for time and date.

END OF SECTION

SECTION 260100

BASIC ELECTRICAL REQUIREMENTS

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Basic electrical requirements specifically applicable to Division 26 sections, in addition to Division 01 - General Requirements.
- B. Furnish all labor, materials, services, supplies, tools, equipment, apparatus, transportation, facilities and incidentals required and perform all operations necessary to accomplish and complete installation of the electrical power, lighting, motor control systems, and electrical accessories as shown on the Contract Drawings, specified herein or as reasonably may be implied as being incidental to this work, and as required for complete electrical systems.
- C. The performance of the work under Division 26 shall be in accordance with the regulations and rulings of all authorities having jurisdiction over the work.
- D. The scope of work involves and includes but is not limited to the following:
 - 1. Power distribution system additions and modifications.
 - 2. Power and control wiring for equipment by mechanical and other systems.
 - 3. Grounding.
 - 4. Lighting systems.
 - 5. Fire alarm system additions and modifications.
 - 6. Electrical systems removal/demolition.
- E. Work of Division 26 shall include the coordination of all arrangements and payment of all required fees for agency permits and associated inspections.

1.3 RELATED DOCUMENTS

- A. This Specification is partially of the abbreviated or "streamlined" type and includes incomplete sentences. Omitted words or phrases shall be supplied in inference in the same manner as they are when a "note" occurs on the Drawings. Words "shall be" will be supplied by inference where colon (:) is used within sentences or phrases.
- B. Drawings and general provisions of the Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all

Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.

- C. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- D. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.
- E. All related Specification Sections shall be used in conjunction with this Section.

1.4 DEFINITIONS

- A. Definitions pertaining to Division 26:
 - 1. Provide: Furnish, install and connect.
 - 2. Furnish: Supply materials only.
 - 3. Indicated: On Contract Drawings.
 - 4. Concealed: Hidden from sight at completion of work.
 - 5. Trade: Electrical Subcontractor.
 - 6. Electrical Subcontractor: The person, firm or corporation performing the work called for in this Electrical Specification, whether they be prime or sub.
 - 7. Whenever the word "Engineer" appears, it shall be construed as meaning the Design Engineer of Record.

1.5 SUBMITTALS

- A. Refer to Division 01 for submittal requirements. The following paragraphs supplement the requirements of Division 01.
- B. Submit shop drawings and product data as requested by other Division 26 sections. All submittals to follow requirements of General Conditions, modifications to General Conditions, and Division 01.
- C. The Contractor will be held responsible for checking and verifying all field measurements, and shall submit promptly, as to cause no delay in any work, shop drawings and schedules required for the work. The Contractor shall check and approve all submittals before forwarding to the Architect. All submittals shall be transmitted to the Architect using the submittal transmittal form contained in Division 01. The Architect will forward submittals to the Engineer. The Engineer will check and review the submittals with reasonable promptness, but only for conformance with design concept of the project and for compliance with information given in Contract Documents. The Contractor shall make any corrections required by the Engineer. The Engineer's review of submittals shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications, unless he has, in writing, called the Engineer's attention to such deviations at the time of submission and has secured the Engineer's written approval. Additionally, the

Engineer's review of submittals shall not relieve the Contractor from responsibility for any errors or omissions contained in the submittals.

- D. Submittals shall be clear and concise. The submittals shall clearly indicate the product name, applicable Specification Section, proposed location and all features and ratings. The intended product shall be differentiated from others with a model number or highlighting.
- E. When necessary, shop and setting drawings shall be based upon actual measurements taken at the site and upon other job conditions. Show any variations and revisions to Drawings or Specifications that are necessary for proper installation.
- F. Submit copies of manufacturer's shop drawings showing illustrated cuts of item to be furnished, scale details, sizes, dimensions, performance characteristics, capacities, installation instructions, wiring diagrams and controls and all pertinent information. Submit the quantity of copies indicated in Division 01.
- G. The Contractor shall note that where more than one manufacturer's name is listed for the various major items of equipment and materials specified herein, the plans and specifications have been developed on the basis of equipment as manufactured by the first manufacturer name. Other manufacturers names are included to indicate the equipment manufactured by them may be considered acceptable for this project, provided that the equipment meets all requirements as to quality, size, adaptability to space requirements, etc. It shall be the Contractor's responsibility to assure that the equipment, as manufactured by other than the first name manufacturer, shall meet all requirements as to equipment ratings, quality, size, capacity, function, adaptability to space requirements, etc. The Engineer's review of shop drawings for equipment as manufactured by other than the first named manufacturer shall in no way relieve the Contractor of this responsibility.
- H. Upon request, samples of electrical items shall be furnished to the Engineer. Samples shall be properly tagged, noting Section and paragraph of Specifications where item is proposed for use and listing project name, Contractor's name, manufacturer's name and identifying number and where applicable.

1.6 OPERATION AND MAINTENANCE DATA

- A. Refer to Division 01 for operation and maintenance manual requirements. The following paragraphs supplement the requirements of Division 01.
- B. The Contractor shall provide the following information in a bound manual:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturer's printed operating procedures to include start-up, routine and normal operating instructions; regulation, control, and emergency instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing instructions and schedules.
- C. Two (2) copies of operations and maintenance data shall be submitted to the Architect for review: one (1) copy shall be returned to the Contractor (with any instructions for changes). After implementing any changes, five (5) copies of instructions covering all equipment shall be furnished to the Architect who will forward two (2) copies to the Owner for his information and use.

- D. Append to the manual, the name, address and telephone number of the Contractors and Subcontractors and for electrical items, provide the name, address and telephone number of companies servicing installed equipment on a 24-hour basis.
- E. After submission and approval of the operating and maintenance data, the Contractor shall furnish competent Operation Engineer(s) at such time or times as directed by the Architect to meet with the Owner or his representative, to fully explain instructions and to demonstrate and fully familiarize the Owner or his representative with all of the equipment and all phases of its operation and maintenance. The amount of time devoted to instructions shall be reasonable and consistent with the size of the installation and the complexity therefore. Instructions shall be adequate to the extent that the Owner's personnel may proceed with normal operations in a safe and efficient manner.

1.7 FINAL SUBMITTALS

- A. As a requisite for final acceptance, the following are required:
 - 1. Project Record Documents:
 - a. During progress of the Work, maintain an accurate record of the installation of the electrical system, locating each concealed conduit precisely by dimension. This shall include, but not be limited to: conduit below ground level and in or below building slab. All service, sub-service and main riser conduits for both power and communication systems. All spare conduits stubbed in concealed spaces and the locations of all electrical equipment essential for system operation (such as end of line resistors, etc.).
 - b. Upon completion of the electrical installation, transfer all record data to prints of the original Drawings. Where required by Division 01, provide project record documents in AutoCAD file format.
 - 2. Manual: Upon completion of the electrical installation, and as a condition of its acceptance, deliver to the Owner and the Engineer operation manuals compiled in accordance with the provisions of Division 01 and Article 1.05 of this specification Section; include one copy of as-built Project Record Drawings in each copy of the manual. Provide quantity of manuals as required in Division 01.
 - 3. Certificates:
 - a. Two (2) copies of the City Building Inspector's Certificate of Approval showing acceptability of work done under this Contract. Deliver to the Owner with a copy to the Engineer.
 - b. Two (2) copies of any other Certificates of Approval. Deliver to the Owner with a copy to the Engineer.
 - 4. At completion of construction, the Contractor shall furnish the Owner with one (1) unused copy of all reviewed shop drawings, manufacturer's diagrams, installation instructions, literature, etc., that were used in execution of the work.
 - 5. Warranties: Provide all indicated warranties in accordance with Division 01.

1.8 SUBSTITUTIONS

- A. Any and all proposed substitutions must be approved by the Architect during the bid phase and must be indicated on the form of proposal. For specific substitution requirements, refer to Division 01.

1.9 COORDINATION

- A. Prepare and submit coordination drawings for all work performed under Division 26 as specified in Division 01.
- B. Coordinate scheduling, proposed routing, and critical dimensions with all other trades prior to roughing and equipment installation.
- C. It shall be the responsibility of the Contractor to verify dimensions and elevations shown or scaled on Drawings by actual field measurements after building construction has progressed to the point where such measurements may be taken.
- D. Advise Owner in writing regarding those critical dimensions which must be held by other Trades as they perform their work.
- E. Assume full responsibility for accuracy of all work under this Division and make corrections as required.
- F. It shall be this Division's responsibility to coordinate with all other Trades and separate equipment contracts regarding mechanical equipment layouts, space requirements, mounting details, "roughing-in" dimensions, and for items substituted for those specified herein to avoid conflict.
- G. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members and mechanical or other equipment, furnish and install all required supports and wiring to clear the encroachment.
- H. Where job conditions require reasonable changes in indicated locations or arrangements prior to roughing, make such changes without extra cost to the Owner.
- I. Any Work installed contrary to or without approval of the Engineer shall be subject to change as directed by the Engineer, and no extra compensation will be allowed the Contractor for making these changes.
- J. Provide all power wiring to equipment furnished by this and other Trades (heating, ventilation, plumbing, general construction, etc.) unless otherwise indicated or specified.
- K. Division 26 shall provide all required circuit breakers in addition to those indicated on panelboard schedule for equipment provided by other divisions.
- L. Where locations are dimensioned on the Drawings, they may be changed only with the written approval of the Owner or his representative. If interferences are found between the electrical work and that of other Trades, Owner shall decide which must be relocated.
- M. Contractor shall study and compare all Contract Drawings, Specifications, and other instructions and shall at once report to the Engineer any error, inconsistency or omission which he may discover.
- N. Where a conflict occurs between this Specification and other Contract Documents, the more stringent requirements shall govern.
- O. Contractor shall have a competent foreman in charge of work with authority to receive verbal and written instructions from Owner. Contractor shall inform Owner of foreman's name and title.

- P. The Drawings are diagrammatic and functional only, and are not intended to show exact layouts, number of fittings, or other installation details. The Contractor shall furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical systems shown. Additional circuits shall be installed by the Contractor wherever needed to conform to the specific requirements of the equipment.
- Q. The locations of equipment, fixtures, outlets, and similar devices shown on the Drawings are approximate only. Exact locations shall be verified during construction so that they shall coordinate with all other work and equipment. The Contractor shall obtain in the field all information relevant to the placing of electrical work and, in case of any interference with other work, shall proceed as directed by the Engineer and shall furnish all labor and materials necessary to complete the Work in an approved manner.
- R. The ratings of motors and other electrically operated devices, together with the size shown for their branch circuit conductors and conduits, are approximate only, and are indicative of the probable power requirements insofar as they can be determined in advance of the purchase of equipment. Equipment sizes may vary from sizes indicated on the Drawings and must be verified with actual equipment to be furnished and coordinated with all other equipment and material sizes. If equipment or material sizes need to change due to this coordination, such changes shall be made with prior Engineer approval and at no cost to the Owner.

1.10 QUALITY ASSURANCE

A. Qualifications of Installers:

- 1. For the actual fabrication, installation, and testing of the Work of this Division, use only thoroughly trained and experienced personnel who are completely familiar with the codes and requirements for this Work and with the installation recommendations of the manufacturers of the specified items.

B. Workmanship:

- 1. Complete electrical installation shall be made in a neat and workmanlike manner and to the full satisfaction and approval of the Owner and Engineer.
- 2. Work not meeting Owner's standard for adequate workmanship shall be removed and replaced at once, at no additional Contract cost to the Owner.
- 3. Remove and replace all work rejected by Owner as defective, non-operational or not in conformance with intent of this Contract.

C. Electrical products used shall be UL listed by Underwriters Laboratories. To assure the proper use of electrical equipment, the Electrical Contractor shall verify compliance by reference to the UL Guide Information for Electrical Equipment - The White Book.

1.11 REGULATORY REQUIREMENTS

A. Perform the work and provide material under this Division in strict accordance with applicable provisions of all governing codes, rules, laws and ordinances as amended and in effect on date of issue for bids, specifically including but without being limited to:

- 1. American National Standards Institute (ANSI).
- 2. American Society for Testing Materials (ASTM).
- 3. Americans with Disabilities Act (ADA).
- 4. Association of Edison Illuminating Companies (AEIC).
- 5. Canadian Standards Association (CSA).

6. Edison Electric Institute (EEI).
7. Environmental Protection Agency (EPA).
8. Factory Mutual (FM).
9. Federal Communications Commission (FCC).
10. Federal Information Processing Standards Publication 94 (FIPS Pub 94).
11. Institute of Electrical and Electronics Engineers (IEEE).
12. Insulated Cable Engineers Association (ICEA).
13. International Building Code (IBC).
14. International Electrotechnical Commission (IEC).
15. International Energy Conservation Code (IEEC).
16. International Organization for Standardization (ISO 9001).
17. Local ordinances, regulations and electric codes.
18. Occupational Safety and Health Act (OSHA).
19. National Electrical Code (NEC).
20. National Electrical Safety Code (NESC).
21. National Electrical Manufacturers' Association (NEMA).
22. National Fire Protection Association (NFPA).
23. Sheetmetal Air Conditioning Contractors National Association (SMACNA).
24. Requirements for Underwriters' Laboratories, Inc. for all items installed for which UL standards have been established.
25. Pertinent requirements of the local utility companies.

B. In each case, codes are minimum requirements.

C. It shall be understood that all codes and standards mentioned shall be those in force at the time the Contract is signed. If any code is changed during the construction period, these Specifications may be changed by change order.

D. Each item of equipment and material shall conform to requirements of these applicable publications which make them most suitable for environmental conditions where they shall be installed.

E. Items which are within scope of items tested by Underwriter's Laboratories, Inc., or other suitable nationally recognized independent testing laboratories shall have their conformance with these applicable publications evidenced by attachment of authorized seal, label, or stamp of those testing laboratories.

F. The Contractor shall cooperate with and assist Owner in securing from the authority enforcing the codes any "special permission" or interpretation needed to complete work.

G. The work required by the Drawings and the Specifications shall comply with applicable codes. Conflicting provisions of the Contract Documents to the contrary notwithstanding, it shall be the sole responsibility of the Contractor as part of the base Contract to execute the work so as to obtain the approval of the Local Authority at completion of the work.

H. On preparing his bid, the Contractor shall carefully check the Drawings and Specifications for compliance with applicable codes and other legal requirements. He shall inform the Engineer in writing of any non-conformance before he submits his bid.

1.12 PROJECT/SITE CONDITIONS

A. Install work in locations shown on the Drawings, unless prevented by project conditions.

- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of Architect before proceeding.

1.13 PRODUCTS

- A. In all design and purchasing, interchangeability of items of equipment, subassemblies, parts, motors, starters, relays and other items is essential. All similar items shall be of the same manufacturer, type, model and dimensions or, in the case of special systems which are a composite of a number of manufacturers' products, shall be supplied and/or serviced from an organization with one source of responsibility.
- B. Provide products which are compatible within systems and other connected items.
- C. For ease of maintenance and parts replacement, to the maximum extent possible, use equipment of a single manufacturer.
- D. The Engineer reserves the right to reject any submittal which contains equipment from various manufacturers if suitable materials can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.
- E. All equipment and fixtures shall be of the capacity and type shown on the Drawings and specified herein and shall be as manufactured by one of the manufacturers designated or shall be an equal approved in advance by the Engineer.
- F. All other materials, not specifically described but required for a complete and operable electrical installation, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the Engineer.
- G. Install all equipment and fixtures in complete accordance with the manufacturer's recommendations and all pertinent codes and regulations.
- H. Materials and equipment shall be listed by Underwriters Laboratories unless it can be demonstrated that no UL standards exist for a specific items or class of equipment.

1.14 NAMEPLATE DATA

- A. Provide permanent operational data nameplate on each item of power operated electrical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.15 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to project properly packaged and protected to prevent damage during shipment, storage, and handling.
- B. Use all means necessary to protect electrical system materials during and after installation and to protect the installed work and materials of all trades until testing and final acceptance.
- C. Store equipment and materials at the site, unless off-site storage is authorized in writing. Product stored equipment and materials from damage.

- D. Provide approved protection of all work and property against damage, injury, loss, etc., until testing and final acceptance. Follow manufacturer's recommendations for protection of equipment and materials during storage and construction; protect equipment outlets, pipe and conduit openings with temporary plugs or caps.
- E. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.
- F. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.
- G. The Contractor shall be responsible for the work of other trades that may be damaged or disturbed in the course of his work and he shall restore the damaged work to the condition existing prior to damage without additional cost to the Owner.

1.16 ELECTRICAL INSTALLATION

- A. Coordinate electrical equipment and materials installation with other building components.
- B. Routing of all conduit racks, which contain multiple conduits and/or cable trays, through public areas shall be coordinated with the architect and the engineer prior to installation. Public areas shall be areas with open ceilings, including, but not limited to, lobbies, atriums, field houses, gymnasiums, multi-purpose rooms, auditoriums, natatoriums, ice rinks, cafeterias, major corridors (both with or without drop ceilings), etc.
- C. Verify all dimensions by field measurements.
- D. Arrange for chases, slots, and openings in other building components to allow for electrical installations.
- E. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
- F. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- G. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
- H. Where mounting heights are not detailed or dimensioned, install electrical conduits and services to provide the maximum headroom possible.
- I. Install electrical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- J. Coordinate the installation of electrical materials, light fixtures, and equipment in ceilings with suspension system, mechanical equipment, and other piping installations.
- K. Note that special efforts have been made to layout mechanical and electrical systems exposed to view in order to achieve a certain aesthetic quality. The Contractor is responsible to layout and install all systems, especially those exposed to view, in a neat, orderly, and workmanlike

manner in order to provide a high quality installation, and to maintain the desired aesthetic quality, as appropriate.

1.17 CUTTING AND PATCHING

- A. Unnecessary cutting and patching shall be avoided through proper planning of work, provision of pipe and duct sleeves and cooperation with other Contractors. Each Contractor shall be responsible for all cutting, patching and restoration of his own work at no expense to the Owner and to the satisfaction and approval of the Owner.
- B. In no case shall structural members be cut or notched without approval of the Engineer.
- C. All patching shall be done only by mechanics who are skilled in this line of work to produce a neat finished job acceptable to the Owner in all respects.
- D. Repair and/or replace the work of Trades damaged as a result of work performed under this Division, at no additional cost to the Owner.

1.18 SURFACE CONDITIONS

- A. Inspection:
 - 1. Prior to all work of this Division, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 2. Verify that the electrical installation may be made in complete accordance with all pertinent codes and regulations and the original design.
- B. Discrepancies:
 - 1. In the event of discrepancy, immediately notify the Engineer.
 - 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

1.19 CLEANING

- A. Thoroughly inspect all equipment and any items dented, scratched or otherwise damaged in any manner shall be replaced or repaired and painted to match original finish.
 - 1. All items so repaired and refinished shall be brought to the attention of the Engineer for inspection and approval.
- B. Upon completion of all installation, lamping, and testing, thoroughly inspect all exposed portions of the electrical installation and completely remove all exposed labels, soil, markings and foreign material.

1.20 VISIT TO SITE

- A. As there may be various conditions at the site which do not show on the accompanying Drawings, or which are at variance with the conditions indicated on the Drawings, it is important that each Bidder visit the site and acquaint himself with existing conditions, and take these conditions into consideration when preparing his proposal. Each bidder shall obtain information or make any measurement desired. Lack of knowledge relative to existing conditions will not be allowed as a basis for extra compensation.

1.21 EXISTING SERVICES

- A. Active: When encountered in work, protect, brace, support existing active drains, gas, electric, water, other services where required for proper execution of work. If existing active services are encountered that require relocation, make request in writing for determination. Do not prevent or disturb operation of active services that are to remain. Repair broken service at no cost to the Owner. Record any existing services encountered on Contractor's job site drawing sets.
- B. Inactive Services: When encountered in work, remove cap or plug inactive services. Notify Owner; protect or remove these services as directed. Record on "as-built" drawings.
- C. Interruption of Services: Where work makes temporary shutdowns of services unavoidable, shutdown at night or at such terms as approved by Owner, which will cause least interference with established operating routine. Arrange to work continuously, including overtime, if required, to assure that services will be shutdown only during time actually required to make necessary connections to existing work.

1.22 MECHANICAL SYSTEMS COORDINATION

- A. Furnish and install, as indicated on the electrical drawings all disconnect switches, motor overload protective devices, contactors, magnetic starters, complete with required pushbuttons, selector switches, and pilots.
- B. Furnish and connect all duct-mounted smoke detectors (installation by Mechanical Contractor).
- C. Provide all power wiring as indicated on the electrical drawings.

1.23 TEMPORARY SERVICES

- A. Lighting: Provide temporary lighting for construction needs throughout the construction period. Areas to be illuminated shall include but not be limited to:
 - 1. Construction areas: Uniform 20 foot-candles minimum.
 - 2. Security area: Uniform 1 foot-candle minimum.

1.24 WARRANTIES

- A. Refer to Division 01 for warranty requirements. The following paragraphs supplement the requirements of Division 01.
- B. Compile and assemble all warranties for equipment specified in Division 26 into vinyl-covered three-ring binders, tabulated and indexed for easy reference.
- C. Provide complete warranty information for each item. Include product or equipment, date of beginning of warranty or bond, duration of warranty or bond, and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.25 GUARANTEE

- A. The Contractor shall guarantee all work to be free from defects for a period of one (1) year after acceptance. Any and all work found defective or not in accordance with the Contract during this period shall be corrected promptly by the Contractor after written notification from the Owner. The Contractor shall repair or correct the work within ten (10) days of the written notification and

if the Contractor does not comply, the Owner may have the work corrected and charge all such work to the Contractor.

1.26 PHASING/WORK SEQUENCING

- A. Refer to General Conditions and Division 01 sections, and to the Construction Manager's and Architect's phasing and/or work sequencing descriptions and/or plan(s), for necessary phasing/sequencing of this project.
- B. Coordinate with the Construction Manager in order to determine all phasing/sequencing requirements and to schedule work. Electrical work shall be executed in such a manner as to cause minimal or no disruption of other trades' activities in the building. Coordinate all deliveries, installations, etc. as required to avoid disruption and/or inconvenience. Continue to inform the Construction Manager and the Architect of work anticipated to take place each day and/or week, sufficiently in advance of the work for comment and potential redirection of those activities to avoid conflict and/or disruption

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

SECTION 260600

GROUNDING AND BONDING

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.

- 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Equipment grounding.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Product Data: Subject manufacturer's data on grounding systems and accessories.
 - 1. Grounding conductors and connectors.
- B. Submit building ground resistance test results in accordance with Section 260800.

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.
 - 1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
 - 2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Firms regularly engaged in manufacturer of electrical connectors, terminals and fittings of types and ratings required and ancillary grounding materials, including stranded cable, copper braid, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer: Qualified with at least three (3) years of successful installation experience on projects with electrical grounding work similar to that required for project.
- C. NEC Compliance: Comply with NEC requirements as applicable to materials and installation of electrical grounding systems, associated equipment and wiring.
- D. UL Compliance: Comply with applicable requirements of UL Standards Nos. 467, 486A and 869 pertaining to electrical grounding and bonding. Provide grounding products which are UL-listed and labeled.
- E. IEEE Compliance: Comply with applicable requirements of IEEE Standard 80 and 142 pertaining to electrical grounding.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle electrical grounding accessories and components carefully to avoid damage; store in original wrappings and protect from dirt and weather.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, providing grounding products of one of the following:
 - 1. Mechanical and compression connectors and fittings:
 - a. Anderson
 - b. Blackburn
 - c. Burndy
 - d. Dossert
 - e. OZ/Gedney
 - f. Thomas & Betts

- B. Substitutions: Items of equal quality, function, and performance may be proposed for substitution by following procedures outlined in Section 16010.

2.2 MATERIALS AND COMPONENTS

- A. General: Except as otherwise indicated, provide electrical grounding systems indicated, with assembly of materials including, but not limited to, cables/wires, connectors, terminals (solderless lugs), bonding jumper braid, and additional accessories needed for complete installation. Where more than one type unit meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products complying with NEC, UL, IEEE and established industry standards for applications indicated.
- B. Conductors: Provide bare, stranded, concentric lay, soft drawn annealed copper cable, Class A or B. Where insulated grounding cables are required, they shall be stranded, 600 volt, Class B., with high molecular weight polyethylene (HMWPE) insulation. Provide conductors in sizes as specified on the Drawings. In instances where sizes are not specified or where NEC requirements are more stringent, provide conductors sized according to NEC.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Installer must examine areas and conditions under which electrical grounding connectors are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 GROUNDING AND BONDING

- A. Coordinate with other electrical work as necessary to interface installation of electrical grounding system with other work.
- B. Flexible metal conduit and fittings not approved for ground bonding shall have bonding jumper.
- C. All equipment enclosures, control panels, motor frames, conduit systems, cable armor, cable tray system, exposed structural steel and similar items shall be grounded.
- D. Conduit runs, metallic wireways and cable trays shall be joined together to form a continuous electrical conductor through standard fittings and connectors.
- E. The Contractor shall exercise care to ensure good ground continuity, in particular between conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.
- F. Circuit Grounding: Install grounding bushings, grounding studs, and grounding jumpers at pullboxes, motor control centers and panelboards.
- G. Where a grounding connection requires the removal of, or disturbs a galvanized or other finished surface, the entire connection shall be suitably finished to provide equal protection.
- H. All contact surfaces that are bolted connectors shall be thoroughly cleaned to bright metal and coated with "NO-OX-ID," or equal, before connections are made.

3.3 BONDING FOR OTHER TRADES

- A. All bonding conductors shall be installed in a neat and workmanlike manner, properly shaped for contour of surface involved and properly supported. At locations remote from the switch gear, bond to the largest raceway nearby.
- B. The points of attachment of the bonding jumper shall be accessible.

3.4 FOR SYSTEMS TELECOMMUNICATIONS GROUNDING AND BONDING

- A. All grounding and bonding connectors shall be listed by a nationally recognized testing laboratory (NRTL) as required by the NEC.
- B. All grounding and bonding conductors shall be copper and may be insulated. When conductors are insulated, they shall be listed for the application. The minimum bonding conductor size shall be a No. 6 AWG or as indicated on the drawings.
- C. Grounding and bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place grounding and bonding conductors in ferrous metallic conduit that exceeds 1 m (3 ft.) in length, the conductors shall be bonded to each end of the conduit using a grounding bushing or a No. 6 AWG conductor, minimum.

END OF SECTION

SECTION 260700

SUPPORTING DEVICES

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Hangars, straps, clamps, steel channel, and fastening hardware for supporting and anchoring conduit and electrical equipment.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 260100.
- B. Provide manufacturer's catalog data for supporting devices and fastening systems.

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.
 - 1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
 - 2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

1.6 SEISMIC RESTRAINTS

- A. Fully conform to 2006 International Building Code, Section 1613 Earthquake Loads ASCE Standard ASCE/SEI 7-Chapter 13 Seismic Design Requirements for Nonstructural Components.
- B. The structural drawings indicate the seismic use group and seismic design category as follows:
 - 1. Occupancy Category: III
 - 2. Seismic Design Category: C
- C. Refer to structural drawings and specifications for further requirements.
- D. The seismic restraint design, consisting of calculations, restraint selection, installation details, and other documentation shall be performed by a professional engineer licensed in the state where the project is located. Submit all documentation with professional seal and signature.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements provide products by the following:
 - 1. Hangers, straps, and beam clamps:
 - a. Eaton
 - b. Erico
 - c. Minnerallac
 - 2. Tie-Wraps
 - a. Thomas and Betts
 - b. Secure Cable Ties
 - c. Essentra
 - 3. U-channel systems, slotted angle, and fittings (1-5/8" x 1-5/8", 12-gauge):
 - a. B-line
 - b. Unistrut
 - c. Globe Strut

4. Anchors:

- a. B-line
- b. Hilti
- c. Eaton

- B. Substitutions: Items of equal quality, function, and performance may be proposed for substituting by following the procedures in Section 260100.

2.2 CONDUIT SUPPORTS

- A. Single Runs: One-hole malleable conduit strap with backer or ring bolt type hangers with clamp backs.
- B. Multiple Runs: Conduit rack with 25% spare capacity. Rack shall be of galvanized steel channel supported by double nuts on 3/8-inch continuous thread, galvanized or cadmium plated steel hanger rods.
- C. Vertical Runs: Channel support with conduit fittings.

2.3 MC/AC TYPE CABLE SUPPORTS

- A. Metallic snap-in type support clips approved for armored MC or AC type cable.
1. Provide fastener for appropriate AC/MC cable size.
 2. Constructed of Spring Steel, unit is capable of being snapped into place on metal studs or beam flanges, or screwed to wood stud, concrete or block.
- B. Flexible Conduit and Cable Hanger
1. Used for support of bundle runs of MC or AC cable (derating ampacity per NEC required).
 2. Constructed of pre-galvanized steel.
 3. Provide size and load rating as required.
- C. Plenum Rated Tie Wraps
1. UL listed Type 21S for use in plenum or air handling spaces.
 2. Constructed of HALAR Fluoropolymer.
 3. Low smoke density and excellent flammability rating of UL 94V-0.
 4. Maroon color.

2.4 EQUIPMENT SUPPORTS

- A. Equipment to be mounted on exterior block or concrete walls or where indicated shall be mounted on 1-5/8" x 1-5/8" minimum galvanized steel channel anchored to the wall.
- B. Equipment weights shall not exceed supporting device capacity.
- C. Plywood backboards shall be 3/4" thick, void-free, Douglas fir, pressure treated with fire-retardant chemicals, one-side sanded, painted gray on all sides with gray fire-resistant paint prior to installation. Sanded side shall face equipment to be mounted. Backboards in telecommunication closets shall be supported 3-1/4" off the wall using back-to-back steel channel spaced no more than 24" on center.

2.5 ANCHOR METHODS

- A. Hollow Masonry: Toggle bolts shall be all steel spring head type.
- B. Concrete and Solid Masonry: Steel expansion anchors or preset inserts. Steel sleeve and expansion anchors utilizing a threaded bolt, lag bolt or threaded stud.
- C. Metal Surfaces: Machine screws, bolts, or welded studs. Machine screws, bolted clamps or power-driven threaded studs.
- D. Wood Surfaces: Wood screws. Pan head sheet metal screws or lag bolts.
- E. Concrete Surfaces: Self-drilling anchors or power-driven studs.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Layout to maintain headroom, neat mechanical appearance and to support equipment loads required.
- B. Conduit and equipment supports shall not impair the building structural integrity. Structural steel joists shall not be drilled or cut. Secure hangers to these materials with mechanical clips.
- C. Conduit and equipment supports shall meet or exceed all seismic restraint requirements of the IBC (International Building Code). Seismic restraint shall meet Category C requirements as a minimum.

3.2 SUPPORTS FOR EQUIPMENT

- A. Contractor shall provide all necessary supports for equipment installed under this Specification Section. Supports shall consist of steel frames, plates, brackets, racks and other shapes of adequate size and fastened with bolts, screws or by welding, to provide rigid support. Welds shall be continuous and, where exposed, ground smooth. Thoroughly clean metal surfaces and apply one coat of primer as required and two coats of finish paint to match equipment. Any other material to be used for support shall have the Engineer's prior approval.
- B. Contractor shall be responsible for fabricating and installing all necessary supplemental supporting structures, including clips, brackets, etc., for conduits, fixtures, and electrical equipment not otherwise provided on pipeways, buildings, vessels, and structures. These shall be adequate for spare or future facilities where applicable.
- C. Contractor shall not drill, burn or weld to tanks, vessels, galvanized structures or finished buildings without specific approval from the Engineer.
- D. Contractor shall check for the extent of fireproofing on all structures and install, as approved, the necessary clips or brackets, required for the support on conduits, fixtures, devices and equipment. Conduits shall not be imbedded in fireproofing.
- E. The Contractor shall be fully responsible for the proper sizing and assembling of support systems to adequately and rigidly support raceways and/or equipment mounted thereon with a safety factor of at least three.

END OF SECTION

SECTION 260750

ELECTRICAL IDENTIFICATION

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Nameplates for all panelboards, cabinets, safety switches, contactors, motor-controllers, individual circuit breakers, control devices, motor control centers, unit substations, switchgear and any other equipment used to control, switch or disconnect electrical circuits shall be provided by the Contractor under Division 26 of the specifications.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Submit product data in accordance with Section 260100.
- B. Submit product data and listing of equipment nameplate lettering.

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.
 - 1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
 - 2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products by the following:
 - 1. Brady
 - 2. Ideal Industries
 - 3. Thomas & Betts
 - 4. Panduit
- B. Substitutions: Items of equal quality, function, and performance may be proposed for substituting by following the procedures in Section 260100.

2.2 NAMEPLATES

- A. Equipment nameplates shall be 1/16" thick laminated phenolic with engraved block letters, white on a black background, securely fasten nameplates to front covers of enclosure with brass screws.
- B. Nameplates for panelboards, switchboards, motor control centers, transformers, unit substations and switchgear shall have 1/2-inch high letters. Identifying the equipment name indicated on the one-line diagram and the voltage. Include the identification of series rated components within this equipment with nameplates using 1/4-inch letters.
- C. Nameplates for individual circuit breakers, disconnect switches, junction boxes, VFDs, and motor starters shall have 1/2-inch letters and shall be as indicated on the one-line diagram and plans, or shall describe the equipment being controlled.
- D. Nameplates for transformers shall have 1/2" high letters and indicate the transformer name indicated on the one-line diagram and the primary and secondary voltages.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated on the plans. Install numbers, lettering, and colors as approved by submittals and as required by code.

- B. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC and ANSI standards.
- C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- D. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance or equipment.

END OF SECTION

SECTION 260800

ELECTRICAL TESTING

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.

- 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. The work shall include complete testing of all equipment and wiring at the completion of the work, the making of any connection changes or adjustments necessary for the proper functioning of the system and equipment and all testing described in this Section. Power distribution, lighting, control and all miscellaneous systems shall be properly adjusted and in working order, as required, at time of final acceptance.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Submit test data and results in accordance with Section 260100.
- B. Submit certification that all required factory testing has been completed by the manufacturer.
- C. Submit name of testing agencies for approval by the Engineer.

- D. Prior to commencing work, submit draft reports indicating testing procedures, sample report forms, and testing data required for approval by the Engineer.
- E. Submit draft copies of completed test reports for review prior to final acceptance of the project.
- F. After Architect and Engineer review, make final requested adjustments and provide final copies of report for inclusion in Operating and Maintenance Manuals by the Architect.
- G. Provide test reports in soft cover, letter size, three-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with equipment identified to correspond with data sheets, and indicating thermostat locations.

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.
 - 1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
 - 2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

1.6 REQUIREMENTS

- A. Furnish all equipment and personnel and conduct all tests required to secure approval of the installation from all agencies having jurisdiction.
- B. Coordinate with other trades in testing equipment furnished by others, including but not limited to:
 - 1. Checking motors for rotation.
 - 2. Running full-load tests on all power consuming equipment.
 - 3. Coordinating and testing control wiring and interlocks.
- C. Contractor shall provide Owner with two (2) working days' notice prior to performing all tests to allow Owner to arrange to witness the tests.
- D. All testing shall be witnessed by the Owner or Owner's representative. The results of all quantitative tests shall be furnished to the Owner in a typed, approved format as indicated herein.
- E. All test results must be accepted by the Owner before the Contractor is relieved of responsibility for the work.
- F. Insulation resistance tests shall not be made on any equipment until the manufacturer's instructions have been checked and an inspection made to see if any components such as surge protection devices, semi-conductors, control relay coils, etc., exist which may be damaged by such tests. Such components shall be isolated from the test potentials before the tests are performed.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. The Contractor shall be responsible for all equipment and materials required to perform all tests as specified herein. All test equipment shall be in first-class condition, correctly calibrated and shall be operated by qualified personnel experienced in the use of the equipment.

PART 3 – EXECUTION

3.1 TESTING

- A. All systems shall test free from mechanical and electrical defects.
- B. Operations tests shall be made of all systems as a condition of acceptance.
- C. Balance connected loads across phases at all panels and load centers.

3.2 WIRE AND CABLE

- A. Testing of conductors shall be done with the conductors disconnected from all equipment.
- B. All conductors shall be tested for continuity, shorts, and grounds. All faulty cables shall be replaced at no cost to the Owner.
- C. Power conductors rated 600 volts shall be given insulation resistance tests with a 1000-volt DC test voltage. The tests shall be between each phase and ground, and between phases. A satisfactory test shall indicate a minimum insulation resistance of 20 megohms.
- D. Contractor shall cooperate after reconnection of existing equipment, with the testing of all systems involved. This shall include, but not be limited to:
 - 1. Checking motors for proper rotation.
 - 2. Coordination and testing control wiring and interlocks.

END OF SECTION

SECTION 261200

CONDUCTORS AND CABLES

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Extent of electrical wire and cable work is indicated by Drawings and schedules.
- B. Types of electrical wire and cable specified in this section include the following:
 - 1. Single conductor copper cables with 600V insulation and jacket.
 - 2. Type MC Cable.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Submit manufacturer's data on conductors and cables in accordance with Section 260100.
- B. Provide product data on conductors, cables, and connectors.

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.
 - 1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
 - 2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

1.6 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacturer of electrical wire and cable products of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing electrical wiring and cabling work similar to that required for this project.
- C. Codes and Standards:
 - 1. NEC Compliance: Comply with NEC requirements as applicable to construction, installation, and color coding of electrical wires and cables.
 - 2. UL Compliance: Provide wiring/cabling and connector products which are UL-listed and labeled.
 - 3. NEMA/ICEA Compliance: Comply with applicable NEMA/ICEA Standards. Follow an approved ICEA color coding method.
 - 4. IEEE Compliance: Comply with applicable requirements of IEEE Standards 82, "Test Procedures for Impulse Voltage Tests on Insulated Conductors," and Standard 141, "IEEE Recommended Practice for Electric Power Distribution for Industrial Plants" pertaining to wiring systems.
 - 5. ASTM Compliance: Comply with applicable requirements of ASTM B1, 12, 3, 8, and D-753. Provide copper conductors with conductivity of not less than 98% at 20°F (68°F).

1.7 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA-specified type wire and cable reels.
- B. The Contractor shall receive all cable shipments, and shall inspect them for damage to reels, lagging or packing material and for integrity of cable and seals. If damage is apparent, lagging or packing shall be removed and cable inspected. All damage or defective cable, reels, packing or end seals shall be promptly reported, in writing, to the Owner. If so directed by the Owner, the Contractor shall check conductor continuity and shall megger test insulation resistance of such cable. Cable with visible water in the interstices shall be reported to the Owner. Contractor has the option of completely replacing damaged reels of cable or trimming away damaged portions. However, trimming shall not be permitted where it would result in need for splices.

- C. After receipt and inspection, cable shall be moved promptly to storage. For outdoor storage, all reels shall be blocked to prevent rolling, and non-reel type containers shall be blocked at least 6 inches above ground and shall be so placed as to be protected against snow, or long exposure to sunlight. Store small wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris, and traffic.
- D. All ends of cable in storage shall be sealed to exclude moisture, and cut ends shall be immediately resealed. Cable sealing shall be by taping with waterproof tapes. For large cables, heat shrinkable caps of proper size may be used for sealing. The cut ends of cable lengths removed for use shall be protected during installation against dirt and water or other liquids.
- E. Partially used cable reels, if stored outdoors, shall be repacked to prevent weathering of the remaining cable.
- F. Handle wire and cable carefully to avoid abrading, puncturing and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.
- G. Returnable reels, when empty, shall be returned to the cable manufacturer in accordance with established procedures or shall be stored, subject to Owner's instructions, for later disposal. Nonreturnable reels shall be disposed of by the Contractor.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a complete installation, and for application indicated. All wire and cable shall be sunlight and moisture resistant, rated for use in wet locations and in cable tray. Except as otherwise indicated, provide stranded copper conductors with conductivity of not less than 98% at 20 deg. C (68 deg. F).
- B. Wire Conformation: Provide THWN or XHHW. Only wires with "W" in the designation shall be used in wet or damp locations.
 - 1. 600-volt wires and cables for building exterior and underground raceway use: Conductor sizes are indicated by American Wire Gauge (AWG). All wire shall be copper, of the highest commercial conductivity. All cables shall be 600 VAC single conductor, #12 AWG stranded, as a minimum, rated to withstand conductor temperatures of 90°C in dry locations and 75°C in wet locations without deterioration.
 - 2. Wire connectors and terminals for use with copper conductors: UL 486A. Solderless connectors for #8 AWG and larger. Mechanically perfect pressure connectors shall be installed at each termination using an Owner-approved crimping method. Pliers that are not designed to be a crimping tool shall not be permitted.
- C. Low Voltage Wiring and Cable:
 - 1. Low voltage power cable shall be single copper conductor with 600V THHN/THWN or XHHW insulation and jacket of flame retardant PVC, CPE or CSPE.
 - 2. Control cable shall be single copper stranded Class B conductors, 600V, THHN/THWN or XHHW insulation and jacket of flame retardant PVC, CPE, or CSPE. Conductor insulation shall be color coded or otherwise labeled to delineate phases.
 - 3. Lighting cables shall be single copper conductor Class B, 600V, THWN/THWN insulation.

4. Solid conductor shall be used for wiring to all low voltage electrical devices including switches and receptacles. Stranded conductor shall be used elsewhere, unless otherwise noted.

D. Type MC Cable:

1. 600-volt aluminum, interlocked armor, solid conductor size #10 and #12, stranded, conductor size #8 and larger. Conductors to be copper, Type THHN/THWN insulation.
2. Filling shall be non-hygroscopic and non-wicking. Core binder shall be polyester tape. Armor shall be interlocked aluminum.
3. Insulated ground wire shall be provided.
4. Where MC cable is used to feed isolated ground receptacle (or equipment) circuits, an isolated grounding conductor shall be supplied in addition to the insulated ground wire.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following (for each type of wire, cable, and connector):

1. Wire and cable:

- a. Cablec Corp.
- b. Alpha Wire
- c. Cerro Wire
- d. General Cable
- e. Southwire Co.
- f. Encore Wire

2. MC cable:

- a. AFC Cable Systems.
- b. Southwire Co.

B. Substitutions: Items of equal quality, function, and performance may be proposed for substituting by following the procedures in Section 260100.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:

1. Install electrical cables, wires, and wiring connectors as indicated, in compliance with applicable requirements of NEC, NEMA, UL, and NECA's "Standard for Installation," and in accordance with recognized industry practices.
2. Coordinate wire/cable installation with electrical raceway, cable tray, and equipment installation work, as necessary to properly interface installation of wires/cables with other work.

B. Wire and Cable Installation:

1. Install wire in conduit runs after concrete and masonry work is complete and after moisture is swabbed from conduits. Wires shall be pulled into conduit without kinking and without scoring conduit.

2. Pull conductors simultaneously where more than one is being installed in same raceway. Unless otherwise noted, install all three phases of a three-phase system in one conduit to avoid inductive currents on the surface of metallic conduit. Grounding conductor shall be run in the same raceway as the current-carrying conductors.
3. All circuits to kitchen equipment shall be run in conduit from the panelboard to the equipment location. MC cables shall not be allowed. Each kitchen circuit shall contain a dedicated neutral and equipment grounding conductor.
4. Use pulling compound or lubricant (powdered soapstone or Wyrease), where necessary; compound used must not deteriorate conductor or insulation.
5. Use pulling means including fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceway.
6. Pulling may be by hand or by power winch. Winches used shall have sufficient capacity to exert a steady, continuous pull. Maximum pulling tension shall be monitored. Values for maximum allowable pulling tension given by the manufacturer shall be observed.
7. Cables which have been pulled in and awaiting termination at some later date shall be sealed in accordance with the cable manufacturer's instructions.
8. Conductors in all panelboards, switchboards, and terminal cabinets shall be neatly fanned in the gutter space and tied.
9. Wiring for all single phase circuits, 20A or smaller, shall be a minimum of 2#12&1#12G-3/4"C for circuit lengths under 100 feet and 2#10&1#10G-3/4"C for circuit lengths 100 feet and over, unless otherwise noted. Circuits for isolated ground receptacles shall include additional isolated ground conductor. Circuits for double switched light fixtures shall include additional switched conductor(s) as required. The sharing of neutral conductors is not allowed.
10. Do not install any wire or cable with less than the minimum bending radius specified by the manufacturer. During pull-in, maintain minimum bending radius as specified by manufacturer.
11. Do not pull cables over sharp corners of trays and supports.
12. Unless otherwise specified, all conduits, wires, and cable that are required to make the electrical connections to equipment, shall be furnished and installed by the Electrical Contractor. All connections to equipment shall be made as shown, specified, and directed, and in accordance with the approved Shop Drawings.
13. In general, control wiring is not shown on the Plans. Refer to individual equipment specifications and control drawings for information.
14. Wire sizes shown on Drawings and otherwise specified are minimum sizes; if wire of sizes specified is not available, furnish wire of next larger size and if required by NEC, also increase the raceway size to accommodate the larger wire used. Make this substitution at no increase to contract cost.
15. All conductors shall have a single, continuous length without splices, except with the approval of the Engineer. Provide junction box where splices are made.
16. All cable in a raceway shall have the same insulation rating.
17. All low voltage signal cable is to be run in a separate raceway from 120-600 VAC cable.
18. If raceway is installed in a manner that varies from what is indicated on the Contract Documents, or so that the shortest distance is not utilized, contact Engineer to determine if voltage drop will affect the size of cable to be installed in the raceway. Cable size shall be adjusted at no cost to the Owner.
19. Power cables coding shall be as indicated below or existing color coding:

120/208 Volt, 3-Phase

Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green

277/480 Volt, 3-Phase

Phase A - Brown
Phase B - Orange
Phase C - Yellow
Neutral - White with colored (not green) stripe
Ground - Green

20. Control wiring shall be color-coded with tracers, no solid color. Where wiring extends outside equipment, provide overcurrent protection in accordance with wire size per NEC.
21. Junction boxes for use with six or more control circuits or low voltage signals shall utilize terminal blocks sized for the intended use with 20% spare termination points in addition to those for all wires (including spare wires).
22. Control wiring terminating at the main control panel shall be terminated by the Contractor at terminal blocks as directed by the manufacturer.
23. Shielded cable shall be grounded at one point only. All cable shields shall be connected to a common ground in a control panel unless otherwise required by manufacturer's instructions.
24. Control wiring installed by Electrical, Mechanical, or Controls Contractor shall be installed in J-hooks, or may share space in cable tray, where allowed. J-hooks shall be mounted at distances not exceeding 4-foot centers, and wiring shall not loop more than 6 inches below the bottom of the hooks. Control wiring shall not be installed in free space, or laid on suspended ceilings.
25. Provide permanent plastic nametag indicated load or function for each circuit at all handholes and manholes.

C. MC Cable Installation:

1. MC cable shall be installed in concealed locations only, where allowed. It shall not be run exposed to sight in finished spaces.
2. Cable shall be properly run through the center of wall studs, and upper and lower plates. No cable shall be run around the face of a stud, plate, or structural member.
3. MC cable shall be properly supported in both vertical and horizontal installations. Fastening supports shall be as approved for type MC cable, by Caddy or equivalent. Plastic ties shall not be used as a supporting method for the cable. MC cable shall be run parallel to, and attached to, building structural steel; it shall not be run across open spaces.
4. Stripping of the armor jacket shall be done by an approved tool, or by scoring and breaking the jacket. Stripping and removal of the jacket shall be done without damage to the interior conductors or their insulation.
5. Fittings approved for Type MC cable shall be used to terminate the cable as required.
6. MC cable shall not be installed in, or near, the ribs of steel roof deck.
7. Type MC cable shall not be utilized for circuits to kitchen equipment.

D. Splices:

1. Splices and taps shall only be allowed inside approved wireways, junction boxes and outlet boxes.
2. Proper sized wirenuts shall be allowed for splices and taps on conductors of #10AWG or smaller.
3. Where splices or taps are required for conductors of #8AWG or larger, use solderless splice and tap connectors that are compatible with the conductor material. Insulate (wrap) 600 volt splices and taps with minimum of three (3) lap wound layers of 3M Scotch Super 33+ tape, or equivalent.
4. Multiconductor, pre-insulated, set-screw type connection blocks, of the proper size for the conductors, shall be permitted. Burndy or equivalent.
5. All feeder circuits and single-load branch circuits shall be of continuous, unspliced conductors from source to terminal point.
6. In wet locations, underground, etc., all splices, taps and connections shall be made waterproof. Conductor insulation shall be well penciled and roughened before applying connector insulation. Apply a minimum of three (3) layers of Scotch 33 tape and coated with Scotch Kote paint. Conductors shall be formed into drip loops so that water will not collect on connections.

E. Schedule of Use:

1. Cable in conduit shall be provided for:
 - a. Feeder circuits (three-phase or single-phase) to panelboards.
 - b. Three-phase branch circuits.
 - c. Underground circuits.
 - d. Exposed to sight branch circuits.
 - e. All circuits to kitchen equipment and receptacles.
 - f. Branch circuit homeruns (from a junction box in the room/space being served or located in the corridor adjacent to the room/space being served to the panelboard)

Note: Conduits for branch circuit wiring shall be run directly from the panelboard to the room where the load is to be connected. Type MC cable can then be used concealed within that room for extension of branch circuit wiring as allowed.

2. Type MC cable shall be provided for:
 - a. Single-phase branch circuit wiring concealed behind architectural finishes (i.e. walls, ceilings, etc.) located within the room/space being served.
 - b. Type MC cable shall not be utilized for homeruns to a panelboard or a switchboard. Provide cable in conduit for homeruns.
 - c. Lighting fixture whips not exceeding 6'0" in length.

NOTE: No MC cable shall be allowed where exposed to sight in finished spaces. The electrical contractor may substitute cable in conduit for MC cable where the contractor deems necessary due to constructability concerns.

3.2 FIELD QUALITY CONTROL

- A. Test wire and cable in accordance with Section 260800.

END OF SECTION

SECTION 261300

RACEWAYS

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Provide all raceways including conduit and couplings. Extent of raceway work is indicated by Drawings and schedules.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contactor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Submit product data in accordance with Division 01 and Section 260100 of the Specifications.

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.

1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

1.6 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 5 years of successful installation experience on projects with electrical raceway work similar to what required for this project.
- C. Codes and Standards:
 1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to raceways.
 2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to electrical raceway systems. Provide raceway products and components which have been UL-listed and labeled.
 3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of raceway systems.

PART 2 – PRODUCTS

2.1 METAL CONDUIT

- A. General: Provide metal conduit, and fittings of types, grades, sizes and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by Owner to fulfill wiring requirements, and comply with applicable portions of NEC for raceways.
- B. Rigid Steel Conduit:
 1. Provide rigid steel, zinc-coated, threaded type conforming to FS WW-C-581, ANSI C80.1, UL 6, and in conformity with NEC Article 344.

Provide zinc coating fused to inside and outside walls by hot dipped galvanizing. Couplings and elbows shall be protected against corrosion in the same manner as the conduit. Threads shall be cut before the zinc coating is applied and the surplus coating removed from the threads after coating.
 2. Provide factory-applied, closed-end thread protectors.
- C. Rigid Metal Conduit Fittings: Provide cast malleable iron, threaded zinc plated fittings, conforming to FS W-F-408 with steel conduit.
- D. Liquid-Tight Flexible Metal Conduit: Provide liquid-tight, flexible metal conduit; construct of single strip, flexible, continuous, interlocked and double-wrapped steel; galvanized inside and outside; coat with liquid-tight jacket of flexible polyvinyl chloride (PVC).

- E. Liquid-tight Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 3, Style G. Provide zinc plated, malleable iron fittings with compression-type steel ferrule and neoprene gasket sealing rings, with insulated or non-insulated throat.
- F. Electrical Metallic Tubing (EMT): Provide EMT that conforms to FS WW-C-563, ANSI C809.3 and UL 797. Only zinc coated ferrous type is acceptable.
- G. EMT Fittings: Provide zinc plated steel fittings (set screw type) with locknut for thin wall conduit, concrete tight. For EMT 1-1/4" and above, provide a minimum of four set screws per coupling and two for connectors and fittings. Set screws shall be of steel.
- H. Snap-in type connectors that do not utilize a locknut are not acceptable.

2.2 CONDUIT ACCESSORIES AND BODIES

- A. Conduit Accessories: Provide conduit accessories of types, sizes, and materials required or indicated, complying with manufacturer's published product information, which mate and match conduit.
- B. Conduit Bodies: Provide galvanized cast-iron (for use with steel raceways), conduit bodies of types, shapes and sizes as required to fulfill job requirements and NEC requirements. Provide conduit bodies with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.

2.3 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide rigid steel conduit, electrical metallic tubing, and liquid-tight flexible metal conduit manufactured by one of the following:
 - 1. Republic Conduit Manufacturing.
 - 2. Allied Tube and Conduit Corp.
 - 3. Wheatland Tube Company.
 - 4. Calpipe Industries, Inc.
- B. Subject to compliance with requirements, provide conduit bodies of one of the following:
 - 1. Appleton Electric; Div. of Emerson Electric Co.
 - 2. Arrow-Hart Div.; Crouse-Hinds Co.
 - 3. Bell Electric Div.; Square D Co.
 - 4. Crouse-Hinds Electrical Construction Materials.
 - 5. Killark Electric Mfg. Co.
 - 6. O-Z/Gedney Div.; General Signal Co.
 - 7. Spring City Electrical Mfg. Co.

- C. Substitutions: Items of equal quality, function and performance may be proposed for substitution by following the procedures outlined in Section 260100.

2.4 CONDUIT SEALING BUSHINGS

- A. Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit passing through concrete floors and walls, consisting of steel sleeve with malleable iron body, neoprene sealing grommets or rings, pressure rings, and cap screws.

PART 3 – EXECUTION

3.1 GENERAL

- A. All wiring shall be in conduits or raceways, unless otherwise indicated. Minimum conduit size shall be as follows:
- 1" for data, telephone, CATV and multiple communication outlets.
 - 3/4" for power and security.
 - 1/2" for fire alarm, intercom or clock outlets.
- B. Install conduit concealed in all areas, except:
1. Motor connections.
 2. Exterior of structures.
 3. Connections to surface-mounted equipment cabinets.
 4. Mechanical and utility areas.
- C. Coordinate installation of conduit in masonry work, or wall construction.
- D. Where indicated on the Contract Drawings, conduits are shown diagrammatically to outline the general routing of the raceway. Actual routes shall be determined by installer and installed at no extra charge. Where a general routing is not indicated, the conduit and cable routing may be developed by the Contractor. However, all routes must be approved by Engineer before being installed. Avoid interference with pipes, ducts, structural members or other equipment. It is anticipated that the shortest conduit and cable route will be utilized to minimize voltage drop.
- E. Complete installation of electrical raceways before starting installation of cables/wires within raceways.
- F. All metal conduits entering boxes, panels, etc., shall be terminated with insulating bushings. Where bushings fabricated entirely of insulating material are used, two locknuts shall be installed to ensure proper rigid connection and electrical grounding continuity between box and conduit.
- G. Provide standard fittings wherever possible. Avoid field bends wherever possible. Bends and offsets shall be made with factory fittings or with an approved hydraulic bender.
- H. Provide standard fittings or field bends with inside radius greater than cable bending radius. Limit the number of bends between pulling points to four 90° bends or the equivalent.
- I. Field bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.
- J. Provide watertight seals for all penetrations through manholes, vaults, tanks, and building walls.
- K. Provide 200 lb. test nylon pull cord, or AWG No. 12 wire in empty conduits. For conduits required to be installed, but left empty, test with ball mandrel. Clear any conduit which rejects ball mandrel. Pay costs involved for restoration of conduit and surrounding surfaces to original condition.
- L. Conduit penetrations through walls, floors, etc., shall not compromise the fire rating. All penetrations shall be sealed with appropriate fire stop material having an equal to or greater than fire rating of the surrounding structure.

- M. Provide a listed conduit seal where conduits leave heated area and enter unheated area, cooler or freezer. Seal conduit using a non-drying sealing putty. Duxseal or equal.
- N. Provide expansion fittings for all conduits in straight runs of over 100 feet in length.
- O. Conduit installation shall meet or exceed all seismic restraint requirements of the IBC International Building Code.
- P. Where conduits penetrate non-fire rated walls, seal around conduits with expanding foam insulation.
- Q. Where conduit stub is provided to accessible ceilings for low voltage wiring, provide an insulating bushing on the conduit ends.
- R. Provide spacing of raceways a minimum of 6 inches from parallel runs of heating system pipes, flues, or other heat radiating piping systems and other heat sources. The minimum spacing shall be increased to ensure that raceways experience no significant temperature rise from external sources. Raceways shall not be embedded in any spray-applied insulation, fireproofing, or other materials that would restrict heat dissipation.
- S. Provide deflection/expansion fittings in conduit runs at all expansion and seismic joints to allow for displacement of conduit by expansion, contraction, and misalignment.
- T. Conduit shall not be installed in, or near, the ribs of steel roof deck.

3.2 METAL CONDUITS

- A. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean. Coat all cut threads with a listed zinc-rich paint, Thomas and Betts, CP8 KOPR-Shield or equal.
- B. Fasten conduit terminations in sheet metal enclosures by 2 locknuts, and terminate with grounding type bushing. Install locknuts inside and outside enclosure.
- C. Mechanically fasten together metal conduits to form continuous electrical conductor. Connect to cable trays, electrical boxes, fittings and cabinets to provide electrical continuity and firm mechanical assembly.
- D. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.
- E. Install liquid-tight flexible conduit for connections to vibrating equipment such as motors, or to equipment which may move due to expansion or adjustment such as motor operated valves or belt-driven equipment, or to equipment which must be capable of ready removal for maintenance. The maximum length of flexible conduit used shall not exceed 6 feet without the prior approval of the Owner. The fixed end of the rigid conduit shall be terminated with a box or, where necessary, a "condulet" type fitting, and, where linear motion of the connected equipment will occur, shall be located approximately at the midpoint of the expected range of movement. Where practicable, the flexible conduit shall have approximately a 90° bend to allow free movement.

3.3 EXPOSED CONDUITS

- A. Support exposed conduit by use of hangers, clamps or clips. Support conduit on each side of bends and on spacing not to exceed NEC requirements.

- B. Conduit placed against concrete above ground shall be fastened to the concrete with pipe straps or on screw conduit clamps attached to the concrete by means of lead expansion screw anchors and screws or preset inserts. Plastic anchors shall not be used.
- C. Install conduits to avoid conflict with passageways or access to, operation or maintenance of, or removal of, electrical or other equipment.
- D. Allow minimum of 6 inches' clearance at flues, steam pipes, and heat sources.
- E. Route all conduits parallel or perpendicular to building lines, structural members and building walls. Routing shall provide maximum clear space.
- F. Provide flashing and pitchpockets making watertight joints where conduits pass through roof or waterproofing membranes.

3.4 SCHEDULE OF USE

- A. Use rigid galvanized conduit for:
 - 1. Exposed exterior conduit.
 - 2. Under floor slabs.
 - 3. Underground conduits for primary transformer conductors.
 - 4. Where in compliance with NEC.
- B. Use liquid-tight flexible conduit where subjected to one or more of the following conditions:
 - 1. Moist or humid atmosphere where condensate can be expected to accumulate.
 - 2. Subjected to water spray or dripping oil.
 - 3. Connections to vibrating equipment.
- C. Use electrical metallic tubing:
 - 1. Where not restricted by the above in interior areas.
 - 2. Where in compliance with NEC.

3.5 ADJUSTING AND CLEANING

- A. Clean raceway interior surfaces before and after installation. Interior surfaces shall be free of imperfections (burrs, dirt, construction debris, etc.), likely to damage cable(s). Clean completed conduit runs with an approved tube cleaner equipped with cylindrical mandrel. Mandrel diameter not less than 85% of conduit inside diameter. Cap conduit ends after cleaning to prevent entrance of water or debris.
- B. Close upper ends of all vertical conduit during construction.
- C. Cap spare conduits using suitable conduit caps/plugs.

END OF SECTION

SECTION 261370

OUTLET BOXES & ENCLOSURES

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Provide outlet boxes.
- B. Provide wireways, pull and junction boxes.
- C. Provide all cabinets and enclosures for the installation of electrical equipment, electrical controls, and process equipment as indicated on the Drawings and as described herein.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Submit product data in accordance with Section 260100.
- B. Submit product data and listing of equipment nameplate lettering.

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.
 - 1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
 - 2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Steel Boxes:
 - 1. Appleton
 - 2. Raco
 - 3. Steel City
- B. Cast Boxes:
 - 1. Crouse-Hinds
 - 2. Killark
 - 3. Appleton
- C. Pull Boxes, Enclosures, Wireways and Cabinets:
 - 1. Hoffman
 - 2. Square D
- D. Substitutions: Items of equal quality, function and performance may be proposed for substitution by following the procedures outlined in Section 260100.

2.2 WALL BOX MATERIALS

- A. Interior Dry Location Boxes: Pressed sheet steel, blanked for conduit or provided with knockouts and clamps for cable, where applicable. Provide side-mounted bracket for locating on stud.
- B. Exterior, Damp Location or Weatherproof Box: Cast aluminum, deep type, with mounting ears.
- C. For Flush-Mounting in Walls: Boxes with matching plaster rings for single- or two-gang outlets. For larger boxes, use solid type or special units. In masonry use deep boxes.
- D. Wall boxes for power and tel/data devices shall not be less than 2-1/2 inches deep, of physical size as required by NEC for the number and size of conductors involved; shall be securely mounted to the building structure with supporting facilities independent of the raceways entering or leaving. Gang boxes shall be used on multiple outlets.
- E. Square conduit boxes shall not be less than 2-1/8 inches deep, of physical size as required by NEC for the number and size of conductors involved; shall be securely mounted to the building

structure with supporting facilities independent of the raceways entering or leaving. Provide plaster ring where applicable.

2.3 PULL BOX, WIREWAY, AND ENCLOSURE MATERIALS

- A. Pullboxes and Junction Boxes: Metal construction, conforming to National Electrical Code, with screw-on or hinged cover.
- B. Flush-Mounted Pullboxes: Provide overlapping covers with flush-head cover retaining screws, prime coated.
- C. Wireway shall be constructed of enamel finish. Size shall be in accordance with manufacturer and NEC for intended fill. Minimum cross section shall be 6" x 6".
- D. Unless otherwise indicated, enclosure types shall be used as follows:
 - 1. NEMA 1 - Interior locations, dry.
 - 2. NEMA 4 - Wet areas, on outdoor structures, in equipment vaults, where moisture is present.
 - 3. NEMA 12 - Interior locations subject to oil seepage or dust may be used in lieu of NEMA 1.

If location is questionable, consult Engineer.

- E. Enclosures shall be fabricated from 16-gauge steel (min.) or equivalent rust-resistant steel with rust-inhibiting primer.
- F. Enclosures shall be sized, as a minimum, as indicated on the Drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Mount outlet boxes flush where conduit is concealed.
- B. Adjust position of outlets in finished masonry walls to suit masonry course lines.
- C. Do not install boxes back-to-back in same wall. Where located on opposite sides of common walls, device boxes shall not be installed back-to-back in the same stud bay. Where possible, all boxes shall be one complete stud bay apart.
- D. Locate boxes in masonry walls so that only a corner needs to be cut from masonry units. Coordinate cutting of masonry walls to achieve neat openings for boxes. Use rotary cutting equipment to cut masonry work for installation of electrical fittings.
- E. Do not use sectional or handy boxes unless specifically requested.
- F. For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes to prevent condensation in boxes.
- G. Wall boxes in block or concrete construction shall be masonry boxes with inside ears and shall be concrete tight.
- H. Locate pullboxes and junction boxes in electrical rooms, utility rooms, above suspended ceilings or storage areas, where accessible, and allowed by the National Electrical Code.

- I. Boxes shall have no openings except through which conduits or cable pass.
- J. Install enclosure(s) in accordance with manufacturer's recommendation, Section 260700 and as shown on the Drawings.
- K. Provide proper grounding for all enclosures in accordance with the NEC and Section 260600.
- L. Verify exact dimensions to ensure that the cabinets specified have space available for the arrangement of equipment provided.

END OF SECTION

SECTION 261400

WIRING DEVICES

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.

- 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Provide wall switches.
- B. Provide receptacles.
- C. Provide cover plates.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Submit product data in accordance with Section 260100.

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.

1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - WALL SWITCHES

A. Subject to compliance with requirements, provide products by the following:

1. Wall switches:
 - a. Bryant
 - b. Hubbell
 - c. Pass & Seymour
 - d. Cooper Wiring Devices
 - e. Leviton
2. Receptacles:
 - a. Bryant
 - b. Hubbell
 - c. Pass & Seymour
 - d. Cooper Wiring Devices
 - e. Leviton
3. Cover plates:
 - a. Bryant
 - b. Hubbell
 - c. Pass & Seymour
 - d. Cooper Wiring Devices
 - e. Leviton

B. Substitutions: Items of equal quality, function and performance may be proposed for substituting by following the procedures outlined in Section 260100.

2.2 SWITCHES

- A. 120-277 Volt Switches: Quiet type, toggle handle, with totally enclosed case, rated 20 ampere or as indicated on the Drawings with silver cadmium oxide contacts. Provide matching two-pole, 3-way and 4-way switches as indicated. Switches shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.
- B. Switches shall be horsepower rated when used to control motor loads.
- C. Color: White handles unless otherwise indicated.
- D. Handles shall be lighted if indicated.

2.3 RECEPTACLES

A. Standard Duplex Receptacles:

1. Full gang size, polarized, duplex, side and back wired or pigtailed terminals, parallel blade, U grounding slot, heavy-duty specification grade (#5362), rated at 20 amperes or as indicated on the Drawings, 125 volts, designed for split feed service, NEMA Type 5 20R. Receptacles shall have a grounding terminal which shall be connected to the outlet box with a grounding conductor to establish continuity.
2. Receptacles intended for use in wet locations shall be weather-resistant, Type WR.
3. Pigtailed terminals shall be stranded wire, 6" lead.

B. Color: White, unless otherwise indicated.

C. Ground fault interrupter receptacles shall be specification grade rated 20 amperes with built in test and reset buttons, and shall comply with NEMA WD 1, NEMA WD 6, UL 498, Federal Specification W-C-596, and UL943, Class A. Feed through feature will protect standard receptacles located downstream. Include indicator light that is lighted when device is tripped. Must have Self-test feature (conducts an automatic test every three seconds, ensuring ground fault protection. If ground fault protection is compromised, power to the receptacle must be discontinued.

D. Schedule of Use:

1. Corrosion-resistant receptacles shall be used in areas of high moisture and in all process areas.
2. Standard receptacles shall be used in interior dry locations including electrical room.
3. Ground fault interrupter receptacles shall be used where required by NEC and where indicated on the Drawings.

2.4 COVER PLATES

A. Materials:

1. Thermoplastic: Smooth face, rounded edge, heavy-duty of nylon, fiberglass or high impact resistant plastic nylon and screws with heads colored to match plate.
2. Flush-Mount Weatherproof While-in-Use Covers: Polycarbonate self-closing receptacle cover rated NEMA 3R. Weatherproof when attachment plug cap is inserted. Two (2) exit ports for 12/3 cord. Complies with NEC 406-9 and UL 514D. Typical to Pass & Seymour WIUFC10. The cover shall be identified as "extra duty."

B. Schedule of Use:

1. Thermoplastic: To be used in interior dry locations unless otherwise indicated.
2. Weatherproof while in use: To be used for all exterior receptacles or areas of high moisture.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Switches:

1. Mount switches at the height indicated on the drawings, above floor to center of device unless otherwise indicated.

2. Switches shall be located to agree with architectural features and shall not interfere with work by other Trades.
3. The location of all devices shall be subject to the approval of the Engineer. The Drawings show approximate locations only.
4. Where groups of switches are shown, they shall be installed in approved gangable boxes with one piece faceplates that completely cover opening in wall.

B. Receptacles:

1. Mount receptacles at the height indicated on the drawings, above finished floor or grade to center of device, unless otherwise noted on the Drawings, with grounding pole at bottom.
2. Outlets shall be located to agree with architectural features and shall not interfere with work by other trades.
3. All receptacles shall be labeled as follows; Circuit #1, Receptacle 1 of 2, Circuit #1, Receptacle 2 of 2.

C. Cover plates:

1. Install cover plates on all wiring devices.
2. Metal faceplates shall be grounded.
3. Provide label indicating panelboard identification and circuit number.

END OF SECTION

SECTION 261500

ELECTRICAL CONNECTIONS

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Extent of electrical connections for equipment is indicated by Drawings and schedules. Contractor shall provide all lugs and termination equipment required to terminate cables and wires installed by him unless furnished with equipment provided by others.
- B. Applications of electrical connections specified in these sections include the following:
 - 1. Power cable terminations.
- C. Electrical connections for equipment, not furnished as an integral part of equipment, are work of this section.
- D. Electrical identification for wire/cable conductors is specified in Division 26 section, "Electrical Identification," and is work of this section.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It

remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on electrical connections for equipment products and materials in accordance with Division 01.

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.
 - 1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
 - 2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

1.6 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors and terminals, of types and ratings required, and auxiliary connection materials, including electrical insulating tape, high voltage cable terminations, and cable ties, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firms with at least 3 years of successful installation experience with projects utilizing electrical connections for equipment similar to that required for this project.
- C. NEC Compliance: Comply with applicable requirements of NEC as to type products used and installation of electrical connections.
- D. IEEE Compliance: Comply with Std. 141, "IEEE Recommended Practice for Electrical Power Distribution for Industrial Plants" pertaining to connections and terminations.
- E. ANSI Compliance: Comply with applicable requirements of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical connections for equipment.
- F. UL Compliance: Comply with UL Std. 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors" including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials which are UL listed and labeled.

PART 2 – PRODUCTS

2.1 MATERIALS AND COMPONENTS

- A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, and other items and accessories as needed to complete terminations of types indicated.

- B. Terminations: Provide electrical terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.
1. All terminal lugs shall be of high conductivity copper.
 2. For copper control and fire alarm cable, provide ring-tongue type insulating gripping, compression type, insulated terminals. Do not use any solder, "push-on" or "quick" type connectors. Forked tongue connectors will be used only with the specific approval of the Owner. Acceptable manufacturers are:
 - a. Amp-Special Industries.
 - b. Burndy Corp.
 - c. Thomas and Betts Corp.
 - d. Ideal Industries.
 3. For power cable, regardless of voltage, provide compression type terminal lugs with NEMA standard bolt hole spacing to match drilling of equipment terminal pads. Lugs for No. 6 AWG and smaller shall be insulated. Lugs for larger conductors shall be uninsulated. Cable terminal lugs shall have the following bolt hole requirements:
 - a. Cable sizes smaller than No. 1/O AWG shall use a single hole lug.
 - b. Cable sizes equal to, or greater than, No. 1/O AWG shall use a two-hole lug, except where limited by the equipment manufacturer's standard design or otherwise indicated.
 - c. Acceptable manufacturers are:
 - 1) Amp-Special Industries
 - 2) Burndy Corp.
- C. Use wire and cable insulation suitable for temperature encountered in heat producing equipment.

2.2 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products by the following:
1. Connectors:
 - a. Amp-Special Industries.
 - b. Burndy Corp.
 - B. Substitutions: Items of equal quality, function, and performance may be proposed for substituting by following the procedures in Section 260100.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. Provide rough-in of electrical services to equipment only after reviewing requirements in approved shop drawings.

3.2 INSTALLATION OF ELECTRICAL CONNECTIONS

- A. Install electrical connectors as indicated; in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
- C. Connect electrical conductors to equipment in accordance with equipment manufacturer's written instructions and wiring diagrams and with Owner's Drawings.
- D. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connections and terminals to comply with torquing values contained in UL's 486A.
- E. Conductors in all panelboards, motor control centers, and terminal cabinets shall be neatly fanned in the gutter space and tied.

3.3 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical connections, Owner or his representative will test connections to demonstrate continuity and correct installation in accordance with the interconnection diagrams and other drawings, as appropriate. Contractor shall correct any miswiring and replace any faulty wires or cables.

END OF SECTION

SECTION 264110

CIRCUIT BREAKERS IN EXISTING INSTALLATIONS

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Provide indicated circuit breakers in existing switchboards, panelboards, or control centers.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.
- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.4 SUBMITTALS

- A. Submit product data in accordance with Section 260100.
- B. Submit data including circuit breaker current, voltage and interrupting ratings and construction.
- C. Submit time-current curves for all overcurrent protective devices with applicable settings indicated.
- D. Submit test results in accordance with Section 260800.

CIRCUIT BREAKERS IN EXISTING INSTALLATIONS

1.5 REGULATORY REFERENCES

- A. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.
 - 1. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
 - 2. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products by the following:
 - 1. Circuit Breakers:
 - a. Siemens
 - b. Square D
 - c. General Electric
- B. Substitutions: Items of equal quality, function and performance may be proposed for substitution by following the procedures outlined in Section 260100.

2.2 CIRCUIT BREAKERS

- A. Circuit breakers shall be molded case, bolt-on heavy-duty type having quick-make, quick-break manually operated toggle mechanism. Handle shall be trip-free with three positions that clearly indicate when the breakers are "on," "off," or "tripped." Multiple-pole circuit breakers shall operate on a common trip principle. All circuit breakers shall provide overcurrent and short-circuit protection.
- B. Where new circuit breakers are to be added to existing switchboards, panelboards, or control centers, they shall be compatible with the existing enclosure.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Provide filler pieces for unused spaces.
- B. Update typewritten directory on inside cover of switchboards, panelboards, or control centers indicating loads controlled by each circuit.
- C. All circuit breakers shall be mounted in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 265100

LIGHTING

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.

1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly, or indirectly.

- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required to the proper execution and completion of the Work.

- C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

1.3 SUMMARY

- A. Section Includes:

1. Solid State Lighting/Light Emitting Diode (LED)

- B. General Requirements:

1. Provide all lighting fixtures as shown complete with all lamps, completely wired, controlled and securely attached to supports.
2. Fixture details shown may be modified by the manufacturer provided all of the following conditions have been met:
- a. Fixture performance is equal or improved.
 - b. Structural, mechanical, electrical, safety, and maintenance characteristics are equal or improved.
 - c. Cost to the Owner is reduced or equal.

- d. Modifications have been reviewed by the Architect and have been approved by the Architect in writing.

C. Regulatory References:

1. All specified items or systems shall be designed, manufactured, tested, and installed in compliance with applicable provisions of all governing codes, rules, laws, and ordinances in accordance with Section 260100.
 - a. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to all applicable documents and to the most recent release when developing the proposal for installation.
 - b. This document does not replace any code, either partially or wholly. The Contractor must be aware of local codes that may impact this project.
2. Materials and installation shall be in accordance with the latest revision of the National Electrical Code, and with any applicable Federal, State, and local codes and regulations.
3. The standards and regulating committees referred in this specification and to which compliance with is required are:
 - a. ANSI C78.379 – Electric Lamps – Incandescent and High-Intensity Discharge Reflector Lamps – Classification of Beam Patterns.
 - b. ANSI C82.1 – Ballasts for Fluorescent Lamps – Specifications.
 - c. ANSI C82.4 – Ballasts for High-Intensity Discharge and Low-Pressure Sodium Lamps (Multiple Supply Type).
 - d. ANSI/NFPA 70 – National Electrical Code.
 - e. ANSI/NFPA 101 – Life Safety Code.
 - f. NEMA WD 6 – Wiring Device – Dimensional Requirements.
 - g. ASHRAE/IESNA Standard 90.1 – Energy Standard for Buildings (current version or most recent approved version by the local authority).
 - h. IECC – International Energy Conservation Code (current version or most recent approved version by the local authority).
 - i. IESNA Standards LM-79 and LM-80 – Electric and Photometric Measurements of Solid State Lighting Products, and Measuring Lumen Maintenance of LED Light Sources, respectively.
 - j. UL Underwriters Laboratories
 - k. NRTL Nationally Recognized Testing Laboratory
4. All fixtures and assembled components shall be new, of good quality, and be approved by and bear the label of UL for the applicable location and conditions (wet, damp, dry, etc.) or other approved testing agencies, i.e. ETL, unless otherwise specified in writing.
 - a. Label shall not interfere with fixture performance, maintenance, or the seating of any fixture element, and shall not be visible during normal fixture operation.

1.4 DEFINITIONS

- A. Lumen: Measured output of lamp and luminaire, or both.
- B. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.5 SUBMITTALS

- A. Submit shop drawings and product data including photometric and pertinent physical characteristics of luminaire data in accordance with Section 260100. All submittals shall have project name and fixture type clearly shown.

1. For standard catalog items with no modifications, submit catalog cut sheets prepared by the manufacturer which clearly show all elements to be supplied and all corresponding product data (including lamping; ballast manufacturer and model number; voltage; accessories or options and any miscellaneous items detailed in the written description of the specification.) If cut sheet shows more than one (1) fixture type, all non-applicable information shall be crossed out.
2. For custom fixtures, modified fixtures or linear fluorescent fixtures mounted in continuous rows, submit a drawing prepared by the manufacturer showing all details of construction, lengths of runs, lamping layout, pendant locations, power locations, finishes and list of materials. Drawings must be to scale. Contractor shall provide manufacturer with field dimensions where required. If scallop shields, wallwash reflectors or baffles are required, drawings shall indicate relative position to wall or adjacent vertical surface.
3. The review of shop drawings and/or product data does not relieve the Contractor and lighting control manufacturer of the responsibility of providing a complete, coordinated and functioning installation. Incompatibilities among equipment and components including, but not limited to, mismatched voltages, differing signal protocol, etc., shall be resolved at the sole responsibility and expense of the Contractor.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals per 260100.
- B. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NFPA 70.

1.8 COORDINATION

- A. Confirm compatibility and interface of other materials with fixture and area. Report discrepancies to the Engineer, and defer ordering until clarified.
- B. Supply frames, trim rings and backboxes to other trades, as may be required.
- C. Coordinate with other trades to avoid conflicts between fixtures, supports, fittings, mechanical equipment and other utilities.
- D. Subsequent to review of shop drawings and prior to ordering fixtures verify voltage at each fixture also consult with all others to determine the type of ceiling and ceiling suspension system in each and every room and order fixtures to suit and fit the particular ceiling and ceiling suspension system. Any extra costs because of failure on the part of this Contractor to verify voltage or ceiling requirements shall be paid for by this Contractor. It is not the intent of fixture catalog numbers shown to classify the voltage, ceiling or ceiling suspension.
- E. Fixtures shall be described herein and on the Drawings and be appropriate for the intended location. All necessary lamps shall be provided with the fixtures. Where indicated on the Drawings, fixtures shall have emergency ballast suitable for emergency use.

1.9 WARRANTIES

- A. All fixtures and workmanship shall be guaranteed free of defects and fully operational for a minimum of one year after the acceptance of the project by the Owner. Any fixtures or workmanship found to be defective during the warranty period will be either fixed or replaced by the Contractor at no cost to the Owner.
- B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Lighting Unit Batteries: five (5) years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining four (4) years.
 - 2. Warranty Period for [Emergency Fluorescent Ballast] Batteries: five (5) years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining four (4) years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Provide light fixtures as indicated on the Drawings. See Lighting Fixture Schedule.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Ferrous mounting hardware and accessories shall be finished using either a galvanic or phosphate primer/baked paint process to prevent corrosion and discoloration of adjacent materials.
- B. For weatherproof and vaportight installation, painted finishes of fixtures and accessories shall be weatherproof enamel using proper primers or hot dipped galvanized and bonderized epoxy, in accordance with manufacturer's requirements. Unless otherwise specified all painted surfaces shall have a life expectancy of not less than twenty years.
- C. Where dissimilar metal parts come in contact with each other, apply to both surfaces a coating material to prevent corrosion.
- D. Fasteners shall be manufactured of non-magnetic stainless steel or anodized aluminum, except in indoor applications where galvanized steel shall be acceptable.
- E. Fixtures shall be free of light leaks and shall be designed to provide sufficient ventilation of lamps and ballasts including vent holes where required.
- F. All recessed fluorescent, incandescent, high-intensity discharge, and LED lighting fixtures shall be provided with an integral, automatic resetting, thermal cut-out.
- G. Outdoor fixtures shall have wire mesh corrosion resistant screens in the vent holes properly sized to prevent incursion of insects, small animals, and/or other small rodents.
- H. All sheet metal work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after

assembly. All sheet metal shall be free of light leaks. All edges shall be finished so there are no sharp edges exposed. All miters shall be in accurate alignment with abutting intersecting members. Piecing of plates in individual runs in single planes and the use of spliced pieces or filler material to cover defective workmanship shall not be acceptable. Sheet metal work shall be properly fabricated so that planes will not deform (i.e. become concave or convex, due to normal expected ambient and operating conditions).

- I. In adjustable fixtures, aiming and positive locking devices shall be provided. Fixtures with an adjustable lamp and using a lamp with an asymmetrical light pattern shall have an aiming stop which can be permanently set so that the lamp shall remain correctly positioned after service or relamping.
- J. Plastic for lenses and diffusers shall be formed of colorless 100% virgin acrylic. The quality of the raw material must meet American Society of Testing Materials (ASTM) standards, as tested by an independent testing laboratory. Acrylic plastic lenses and diffusers shall be properly cast, molded, or extruded, as specified, and shall remain free of any dimensional instability, discoloration, embrittlement, or loss of light transmittance for at least 15 years. Glass used for lenses, refractors, and diffusers in incandescent lighting fixtures shall be tempered for high impact and heat resistance; the glass shall be crystal clear in quality with a transmittance of no less than 88%. Exterior fixtures shall use tempered Borosilicate glass, Corning #7740 or equal. For fixtures directly exposed to the elements and aimed above the horizontal, use Corning Vycor glass or equal. Where optical lenses are used, they shall be free from spherical and chromatic aberrations and other imperfections that may hinder their functional performance.
- K. All lenses, louvers, and other light-diffusing elements shall be removable, but positively held so that hinging or other normal motion will not cause them to drop out.
- L. All "open" metal halide fixtures without protective lenses must have an exclusionary socket to prevent the use of lamps that are not "O" rated.
- M. All light fixtures with integral daylight or occupancy sensors shall have said sensors installed by the fixture manufacturer, in accordance with the sensor manufacturer's requirements, and at the location as shown or described in the specifications or plans. Proper wiring, either to an integral device in the fixture or to an external system, shall be provided in the factory.
- N. All aircraft cable suspended pendants or linear fluorescent light fixtures shall be provided with a minimum slack of 24" of cable in addition to the specified suspension length (or mounting height as the case may be) and adjustable, locking cable grippers so that the mounting height may be adjusted in the field. The Contractor shall not cut the spare cable length before the Architect has approved the final mounting height.
- O. Any fixture or part thereof that has been specified with an incompatible, part, lamp, or accessory, as determined by the Contractor and/or fixture manufacturer shall not be ordered and or installed and shall instead be immediately brought to the attention of the Architect, Lighting Designer, and Engineer. Failure of the Contractor to address any known issues, which results in the delay of procuring the proper equipment, shall be the responsibility of the Contractor.

2.3 SOLID STATE LIGHTING/LIGHT EMITTING DIODE (LED) LAMPS AND LUMINAIRES

A. General:

- 1. The electrical contractor, in cooperation with lighting control manufacturer and light fixture manufacturers, is responsible for ensuring compatibility between all LED Drivers and the lighting control system components. All proposed LED fixtures shall be tested by the

- lighting control manufacturer at the factory to verify compatibility prior to installation in the field. If any LED fixture is determined to be not compatible with the proposed lighting control system, it is the electrical contractor's responsibility to work with the light fixture manufacturer to provide a driver that is compatible with the lighting control system.
2. All 0-10VDC LED dimming drivers shall meet the requirements of IEC 60929 for current sinking control and shall have an isolated 0-10VDC control circuit.
 3. Luminaire manufacturer shall have a minimum of five (5) years' experience in the manufacture and design of LED products and systems and no less than one hundred (100) North American installations.
 4. Unless otherwise specified, all LED luminaires and power/data supplies shall be provided by a single manufacturer to ensure compatibility.
 5. All components, peripheral devices and control software are to be provided by and shall be the responsibility of a single entity. All components shall perform successfully as a complete system.
 6. Include all components necessary for a complete installation. Provide all power supplies, synchronizers, data cables, and data terminators for a complete working system.
 7. LEDs shall comply with IESNA LM-80 – Standards for Lumen Maintenance of LED Lighting Products.
 8. White LEDs shall have a rated source life of 50,000 hours under normal operating conditions. RGB LEDs shall have a rated source life of 100,000 hours. LED "rated source life" is defined as the time when a minimum of 70% of initial lumen output remains.
 9. Manufacturer shall provide Luminaire Efficacy (lm/W), total luminous flux (lumens), luminous intensity (candelas) chromaticity coordinates, CCT and CRI. optical performance, polar diagrams, and relevant luminance and illuminance photometric data. Provide data in IES file format in accordance with IES LM-79-2008, based on test results from an independent Nationally Recognized Testing Laboratory.
 10. All LED sources used in the LED luminaire shall be of proven quality from established and reputable LED manufacturers and shall have been fabricated after 2007. Acceptable LED lamp manufacturers unless otherwise noted are:
 - a. Cree, Inc.
 - b. Philips Lighting
 - c. Nichia Corporation
 - d. Norlux
 - e. Opto Technology, Inc.
 - f. Osram Optron Semiconductor

B. Replacement and Spares:

1. Manufacturer shall provide written guarantee of the following:
 - a. Manufacturer will keep record of original bin for each LED module and have replacement modules from the same bin available for three (3) years after date of installation.
 - b. Manufacturer will keep an inventory of replacement parts (source assembly, power and control components).
 - c. Manufacturer's LED system will not become obsolete for ten (10) years: Manufacturer will provide exact replacement parts, or provide upgraded parts that are designed to fit into the original luminaire and provide equivalent distribution and lumen output to the original, without any negative consequences.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Lighting Fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.

2. Install specified lamps in each luminaire
 3. Install accessories furnished with each luminaire.
- B. Install all lighting fixtures in accordance with manufacturer's instructions.
- C. The care and protection of all fixtures shall be the responsibility of this contractor until the work under this contract is accepted by the owner.
- D. Shipping and Storage:
1. All fixtures received at the site shall be stored in clean and dry space until fixtures are installed.
 2. Manufacturer shall clearly mark each box with fixture designation prior to shipping.
 3. Reflector cones, baffles, louvers, aperture plates, gimbal rings, and decorative elements shall be packed by the manufacturer separate from the housing body (body, stem, etc.) of the fixture.
- E. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- F. Remote Mounting of Ballast: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturer, maximum distance between ballast and luminaire.
- G. All fixture wiring shall be in accordance with NEC article 410 whenever high temperature insulation is required instead of normal branch circuit wiring.
- H. Install fixtures to dissipate ballast and lamp heat.
- I. Exit signs and emergency lighting units shall be wired ahead of all switching.
- J. Verify lighting switching with Engineer, if necessary for intended operation.
- K. Install exterior fixtures so as to prevent the entrance of water or other substances.
- L. Fixtures recessed in ceilings which have a fire resistive rating of one hour or more shall be enclosed in a box/structure which has a fire resistive rating equal to or greater than that of the ceiling.
- M. Luminaires containing ballasts/drivers shall be supported directly to the building structure by wire, chain, or threaded rod of sufficient strength to carry the luminaire.
- N. In no case shall fixtures be supported from ductwork, piping, or other equipment.
- O. Fixtures and/or fixture outlet boxes shall be provided with hangers that adequately support the full weight of the fixture. Design of hangers and method of fastening other than herein specified shall be submitted to the Architect for approval. Fixtures mounted on outlet boxes shall be rigidly secured to fixture studs in outlet box. Hickies or extension pieces shall be installed where required to facilitate proper installation. Fixtures weighing more than 50lbs shall be supported independently of the outlet box.

- P. Fixtures shall be installed in accordance will any applicable seismic codes.
- Q. For fixtures with variable position lamp holder assemblies, contractor shall confirm prior to installation proper lamp holder (socket) position in field, and shall adjust, if necessary, after coordination with manufacturer.
- R. Contractor shall be responsible for adjusting aperture rings on all ceiling recessed fixtures to accommodate various ceiling material thickness. Contractor shall be responsible for coordinating the cut-out size in ceiling to ensure aperture covers cut-out entirely. The bottom of aperture rings shall be flush with finished ceiling or not more than 1/16" above. Under no circumstances will the aperture ring extend below the finished ceiling surface.
- S. Fixtures shall be installed so that no labels will be visible under normal operating conditions of the fixture.
- T. Do not install lenses, trims, reflectors, cones, baffles, louvers, or decorative elements until completion of ceiling installation, plastering, painting, and clean-up. All non-removable lenses, trims, reflectors, cones, baffles, louvers, and decorative elements shall be protected from damage during construction. Replace painted, scratched, dented, or otherwise damaged fixture components at no cost to the owner.
- U. Locations of fixtures are show diagrammatically. Verify exact location and spacing with Reflected Ceiling Plans and other reference data before ordering of fixtures and during installation.
- V. Fixture locations in mechanical and electrical rooms, unless otherwise noted, are approximate. Coordinate mounting height and location of lighting fixtures to clear mechanical, electrical, plumbing, and fire protection equipment and to adequately illuminate meters, gauges, and equipment. Pendant mounted fixtures shall be secured appropriately in areas of high air movement.

3.2 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes.

3.3 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery/generator and retransfer to normal.
- B. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.
- C. Prepare a written report of test, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to the lighting system, retest to demonstrate compliance with standards.

3.4 STARTUP SERVICE

- A. Fixtures shall be thoroughly cleaned of all dust, dirt, debris, and fingerprints, following manufacturer's instructions. If the fixtures are deemed dirty by the Architect at the completion of the project, the contractor shall clean them at no additional cost to the owner.

- B. All adjustable lighting units shall be aimed, focused, locked, etc. by the contractor, under the supervision of the Lighting Designer. All aiming and adjusting shall be carried out after the entire installation is complete. All ladders, scaffolds, etc. required shall be furnished by the contractor. As aiming and adjusting is completed, locking setscrews and bolts and nuts shall be tightened securely. Where possible, units shall be focused during the normal working day. However, where daylight interferes with accurate assessment of fixture focus, aiming shall be accomplished at night.
- C. Replace any failed lamps concurrent with owner's final acceptance of project.

END OF SECTION

SECTION 267200

FIRE ALARM SYSTEM

(TRADE CONTRACT REQUIRED AS PART OF SECTION 260001)

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Publicly Bid Trade Contract Requirements: As provided under Section 260001 - Electrical Trade Contract Requirements and supplemented under the Bidding Requirements, Contracts Forms, and Conditions of the Contract, and applicable parts of Division 01 - General Requirements.
 - 1. Work of this Trade Contract includes all individual specifications sections listed in Section 260001.

1.2 WORK INCLUDED

- A. Provide system modifications/relocations and additions for a complete and operable fire alarm system (for the spaces indicated on the Drawings).
- B. Existing system is manufactured by Simplex.
- C. Existing smoke detectors and notification devices shall remain in place as shown on the Drawings, unless otherwise indicated. Existing devices to be relocated shall be cleaned and reinstalled in the new locations where shown on the Drawings.
- D. System Description:
 - 1. General: Complete, non-coded, analogue addressable, microprocessor-based fire detection and alarm system with manual and automatic alarm initiation, addressable analog initiating devices.
 - 2. The fire alarm system shall allow for loading and editing special instructions and operating sequences as required. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory.
 - 3. Audible Alarm Notification: Shall be horn/strobes as noted on plans. Strobes shall be synchronized.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly or indirectly.
- B. The Specifications and Drawings are intended to be complementary. A particular section, paragraph, or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all

of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail. It remains the responsibility of the Contractor or Subcontractor to provide all items, equipment, construction, and services required for the proper execution and completion of the Work.

C. Reference listings are provided as a convenience to the Contractor or Subcontractor providing the Work of this Section and may not contain all the requirements affecting this Section. It remains the responsibility of the Contractor or Subcontractor to locate and comply with all requirements of the Contract Documents.

D. Related Documents:

Section 260100 - Basic Electrical Requirements
Section 260600 - Grounding and Bonding
Section 260700 - Supporting Devices
Section 261300 - Raceways
Section 261370 - Outlet Boxes and Enclosures
Section 233250 - Fire Protection
Division 23 - HVAC Systems

1.4 SUBMITTALS

A. Submit product data in accordance with Section 260100.

B. Submittals shall be as a complete set. Partial submittals will not be acceptable.

C. Submit construction documents including but not limited to all of the following:

1. Floor plans with devices shown.
2. Locations of alarm initiating and notification appliances.
3. Alarm control and trouble signaling equipment.
4. Battery Calculations
5. Annunciation.
6. Riser diagram showing room numbers, devices, and conductor types and sizes of wiring. All alarm circuits and systems interconnections.
7. Manufacturers, model numbers, and listing information for equipment, devices, and materials.
8. The interface of fire safety control functions.

D. Documentation of all voltage drop calculations to verify a maximum of 10% voltage drop or less, if required by the manufacturer of all notification devices and 0.5 dB drop of all audio circuits.

1.5 REGULATORY REFERENCES

A. All work shall be in accordance with the latest edition of Pamphlet No. 71 and No. 72 of the National Fire Protection Association's National Fire Code, local code requirements, and National Electrical Code. Contractor should obtain a copy of the latest Harvard University codes and specs for the installation of Fire Protection Systems.

B. All equipment shall be UL listed and designed for the intended use. All equipment shall be of the same manufacturer.

C. All necessary permits and approvals shall be obtained from the fire department responsible for the area. All associated fees shall be included in this contract.

- D. NFPA Compliance: Provide fire alarm and detection systems conforming to the requirements of the following publications:
 - 1. NFPA 72 "National Fire Alarm Code."
- E. 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 "UL" label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listings shall NOT be acceptable.
- F. All control equipment must have transient protection to comply with UL 864 requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Existing Fire Alarm System:
 - 1. Simplex

2.2 NOTIFICATION DEVICES

- A. Audible and visual light alarm units shall be provided to alert building occupants of a fire alarm condition. Audible devices shall be of suitable size to provide alarm indicated in the intended area during normal operational conditions. Number indicated on the Drawings is a minimum. Manufacturer shall approve the final layout.
 - 1. Strobes shall be xenon type, with an intensity level as indicated on the drawings and a flash rate between 1 Hz and 3 Hz. The color shall be clear or nominal white.
 - 2. Horn/strobe alarms shall be provided to alert occupants of an alarm condition. Alarm signals shall be unique from any other signal in the building. Horn sound levels shall be between 85 dBA and 120 dBA. Strobe shall be as specified above.
 - 3. Exterior bells or Horn/strobes shall be UL listed for wet locations. The bell shall be steel finished in red enamel with a sound level of no less than 85 dBA.
 - 4. All strobes shall be synchronized.
 - 5. Where required, provide manufacturer supplied backbox and skirt for surface mount installation.

2.3 MANUAL FIRE ALARM STATIONS

- A. Manual fire alarm stations shall be manufacturer's standard double-action, keyed reset construction, painted red, semi-flush mounted where possible. Pull stations shall contain communication transmitter and receiver having a unique identification and capability for status reporting to the control panel. Addressable module shall be contained within the pull station.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Fire alarm system shall be installed in accordance with manufacturer's recommendations. All detector and alarm wiring shall be in 1/2" conduit minimum. Wires shall not have splices, and connections shall be at equipment terminals. Manufacturer recommended wire size, taking into account voltage drop, ampacity, etc., shall be used with #16 AWG for initiating circuits and #14

AWG for alarm circuits being minimum. Provide all necessary wiring to and from the control panel.

- B. Fire alarm system shall be approved by the local authority.
- C. Fire alarm system shall be tested and if any equipment is faulty or does not operate as intended, that equipment shall be replaced until the system is in proper working order. This shall be done at no additional cost to the Owner.
- D. Audible fire alarms shall be tested to ensure suitable decibel level throughout the building. Low noise areas shall have assumed 40 dBA ambient noise level and high noise areas 80 dBA. Refer to NFPA 72. Additional horn or speaker units shall be provided if necessary to meet NFPA requirements at no cost to the Owner.
- E. Power for the control panel shall be provided as shown on the Drawings.
- F. Number and location of flow and tamper switches for sprinkler system is approximate only. Coordinate actual number and locations with sprinkler system contractor prior to the installation of any cable or conduit. If necessary, additional devices shall be provided at no cost to the Owner.
- G. Manufacturer's recommended spacing for heat and smoke detectors shall not be exceeded.
- H. All indicated or required interlocks with mechanical equipment shall be provided.
- I. Maximum installed loop capacity shall be 80% of allowable. Provide 20% spare capacity on all loops.
- J. Provide as-built plans with addresses to Owner.
- K. Provide a label on each initiation device to identify the system address to comply with Harvard University requirements.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system. Manufacturer's representative shall provide all final connections within FACP and remote transponders and shall be present during final fire department sign off of system.
- B. Provide 100% system test at the end of the installation and provide testing reports to the owner.

3.3 CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt and debris. Touch up scratches and mars of finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.4 DRAWINGS

- A. Manufacturer shall supply to the electrical contractor a complete set of engineering documents depicting the following information, the cost of which shall be included in the base price:

1. Complete riser diagrams showing overall system wiring.
2. FACP internal card locations with wire termination points shown.
3. Battery calculations showing standby and alarm current draws for a TRUE indication of the required 60-hour calculation.
4. Architectural prints with just fire alarm equipment and devices using vendor symbology to include address, loop number, and NAC wiring circuit and termination points on the architectural drawings. These should be provided on a per section basis and by floor.
5. A complete table showing all addressable devices, recommended labeling of devices, and proper switch settings for desired address contained on the drawings.
6. Depiction of wiring with recommended cable chart and point to point wiring layout between all devices.

END OF SECTION

SECTION 321216

BITUMINOUS CONCRETE PAVING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Contract Documents:

1. Work requirements are contained in Contract Documents and include cross-references to published information, which are not necessarily bound as part of this Project Manual.
2. Drawings and General Provision of the Contract, including General and Supplementary Conditions, and other Division 1 Specification Sections, apply to work and all Specification Sections of this Project.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials, supervision, and equipment necessary to complete the work of this Section, including but not limited to the following: bituminous concrete paving for vehicular drive, including aggregate base course, in accordance with the Drawings and Specifications.
- B. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council. Refer to Section 018110, SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:
1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation.
 2. Section 321413, PORTLAND CEMENT CONCRETE PAVING; detectable warning plates.
 3. Section 329200, LAWNS AND GRASSES.
 4. Section 329300, TREES, PLANTS, AND GROUND COVERS: New plant material

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. American Association of State Highway and Transportation Officials (AASHTO):-Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation.

M 20	Penetration Graded Asphalt Cement
M 81	Cut-Back Asphalt (Rapid Curing Type)
M 140	Emulsified Asphalt

2. American Society for Testing and Materials (ASTM):
 - D 979 Sampling Bituminous Paving Mixtures
 - D 1557 Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (475-mm) Drop
 - D 3549 Thickness or Height of Compacted Bituminous Paving Mixture Specimens
 - D 1188 Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
 - D 2041 Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
 - D 2726 Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
 - D 2950 Density of Bituminous Concrete in Place by Nuclear Methods
3. Federal Specifications (Fed. Spec.):
 - SS-S-1401 Sealing Compound, Hot Applied, for Concrete and Asphalt Pavements
 - TT-P-115E Paint, Traffic, Highway, White, and Yellow
4. Commonwealth of Massachusetts Highway Department (MHD):
 - Specifications Standard Specifications for Highways and Bridges

1.5 QUALITY ASSURANCE

- A. Unless otherwise specified, work and materials for construction of the asphaltic concrete paving shall conform to the applicable portions of the following:
 1. Commonwealth of Massachusetts Highway Department (MHD):
 - Specifications Standard Specifications for Highways and Bridges
- B. Paving work, base course etc., shall be done only after excavation and construction work which might damage them has been completed. Damage caused during construction shall be repaired before acceptance.
- C. Repair and/or replace existing paved areas damaged during this Project. Workmanship and materials for such repair and replacement shall match those employed in existing work, except as otherwise noted.
- D. Pavement subbase shall not be placed on a muddy or frozen subgrade.
- E. Existing pavement under state or local jurisdiction shall, if damaged or removed during the course of this project, be repaired or replaced under this section of the specification in conformance with applicable codes, standards, and practices.
- F. Qualifications:
 1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.
 2. Contractor shall have a minimum 5 years experience installing bituminous concrete pavements and shall have successfully completed at least three projects of comparable scale within the past 3 years

- G. Contractor shall provide and pay for testing procedures specified herein. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, and in accordance with Section 014320, QUALITY CONTROL AND TESTING SERVICES.
- H. The Owner reserves the right to retain an independent testing laboratory to perform inspection and testing of paving and associated work in accordance with Section 014320, QUALITY CONTROL AND TESTING SERVICES.
- I. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.
- J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Shop Drawings: Indicate pavement markings, cross walks, lane separations, and defined parking spaces. Indicate, with international graphics symbol, spaces dedicated to people with disabilities.
- D. Qualification Data: For manufacturer.
- E. Material Certificates: For each paving material, signed by manufacturers.
- F. Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.5 deg C).
 - 2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
 - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
 - 4. Asphalt Surface Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE

- A. Material for gravel base course shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials, and which can be readily compacted to form a stable foundation.

1. Material shall conform to MHD Specifications Section M1.03.0 Type b, with less than 8% by weight passing No. 200 sieve.

2.2 ASPHALTIC CONCRETE

- A. Asphaltic shall be a standard plant-mixed, hot-laid paving material for road work, consisting of clean, crushed rock aggregate, mineral filler, and asphalt equal to Class I, Type I-1, in accordance with MHD Specifications Section M3.11.03, except as modified herein. The master range composition tolerances for bituminous concrete materials shall be as follows.

Table A (As modified)
Percent by Weight Passing Square Opening Sieves

<u>Standard Sieve Size</u>	<u>Base Course</u>	<u>Binder Course</u>	<u>Top Course (Dense Mix)</u>
2 in.	100		
1 in.	55-80	100	
3/4 in.	80-100		
5/8 in.			
1/2 in.	40-65	55-80	100
3/8 in.			80-100*
No. 4	20-45	28-50	55-80
No. 8	15-33	20-38	48-63
No. 16	36-49		
No. 30	8-17	8-22	24-38
No. 50	4-12	5-15	14-27
No. 100		6-18	
No. 200	0-4	0-5	4-8
Bitumen	4.0-5.0	4.5-5.5	7-8

* For dense mix the maximum aggregate size allowable shall be 3/8 in. AASHTO M20.

1. Base or bottom course paving shall have maximum aggregate size passing 2 in. sieve, and bitumen content of 4.5% + 1/2% by weight.
 2. Binder course paving shall have maximum aggregate size passing 1 in. sieve, and bitumen content of 5% + 1/2% by weight.
 3. Top course paving for sidewalks shall conform to composition for "Dense Mix".
- B. Complete job mix formula, listing quantities and pertinent ingredient properties, shall be submitted to and approved by Architect at least two weeks before work is scheduled to begin:

2.3 BITUMINOUS MATERIALS

- A. Bituminous material for prime coat shall be one of the following:
 1. Cut-back asphalt (rapid-curing type) conforming to AASHTO M 81, Grade RC-70 or RC-250.
 2. Emulsified asphalt rapid-setting type conforming to AASHTO M 140, Grade RS-1.
- B. Bituminous material for tack coat shall be emulsified asphalt rapid-setting type conforming to AASHTO M 140, Grade RS-1.

- C. Bitumen shall be a rapid-setting type emulsified asphalt conforming to AASHTO M 140, Grade RS-1.
- D. Bituminous crack sealer shall be a hot-applied bituminous sealer conforming to Fed. Spec. SS-S-1401.

PART 3 - EXECUTION

3.1 GRADING

- A. Areas to be paved will be compacted and brought approximately to subgrade elevation with Granular Fill under Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.
- B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be Granular Fill material conforming to this Section.
- C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below gravel base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.
- D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING. Completed subgrade after filling such areas shall be uniformly and properly graded.
- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.
- F. Materials shall not be stored or stockpiled on subgrade.
- G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following.
 - 1. Material shall be legally disposed of off-site.
- H. Prepared subgrade will be inspected and tested by an independent testing agency, provided and paid for by the Contractor, prior to installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.
 - 1. Contractor shall submit a minimum of six (6) Proctor compaction test results indicating conformance to compaction density requirements specified herein.

3.2 AGGREGATE BASE COURSE

- A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:
 - 1. MHD Specifications Section 405, "Gravel Base Course".
- B. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 in. shall be excluded from course.
- C. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.
- D. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton steel wheel roller or vibratory roller equivalent to a 6 ton static roller, or an approved equivalent.
 - 1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
 - 2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
 - 3. Surface irregularities which exceed 1/2 in. measured by means of a 10 ft. long straightedge shall be replaced and properly compacted.
- E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.
- F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.3 ASPHALTIC PAVING

- A. Asphaltic paving mixture, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base, etc., shall conform to MHD Specifications Section 460 Class I Bituminous Concrete Pavement for roadway and parking areas and Section 701 Sidewalks, Wheelchair Ramps, and Driveways for sidewalks.
- B. Complete job mix formula, listing quantities and pertinent ingredient properties, shall be submitted to and approved by Architect at least two weeks before work is scheduled to begin.
- C. Asphaltic base, binder, and wearing courses shall each be applied individually, in single lifts of full thickness indicated on the Drawings.
- D. Work shall not be performed during rainy weather or when temperature is less than 40o F. or 60o F. as indicated in Paragraph 1.06.
- E. Adjacent concrete work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original condition.

- F. Existing paved surfaces to be resurfaced shall be cleaned of foreign and objectionable matter with blowers, power brooms, or hand brooms immediately before applying bituminous pavement. Cracks shall be cleaned and bituminous crack sealer applied to fully seal pavement.
- G. The surface of the pavement to be resurfaced shall receive a bituminous prime coat before laying asphaltic binder course. Prime coat shall be applied at rate which will leave asphaltic residue of 5 to 7 gal./100 sq. yd. after evaporation of vehicle. Base surface shall be dry and clean when prime coat is applied. Asphaltic paving material shall not be placed until vehicle has completely evaporated from prime coat. Adjoining new paving shall be placed before prime coat has dried or dusted over.
- H. Deliveries shall be timed to permit spreading and rolling all material during daylight hours, unless artificial light, satisfactory to Architect, is provided. Loads which have been wet by rain or otherwise will not be accepted. Hauling over freshly laid or rolled material will not be permitted.
- I. Placing and rolling of mixture shall be as nearly continuous as possible. Rolling shall begin as soon after placing as mixture will bear the operation without undue displacement. Delays in rolling freshly spread mixture will not be permitted. Rolling shall proceed longitudinally, starting at edge of newly placed material and proceeding toward previously rolled areas. Rolling overlap on successive strips shall be greater than or equal to 1/2 width of roller rear wheel. Alternate trips of roller shall be of slightly different lengths. Corrections required in surface shall be made by removing or adding materials before rolling is completed. Skin patching of areas where rolling has been completed will not be permitted. Course shall be subjected to diagonal rolling, crossing lines of the first rolling while mixture is hot and in compactable condition. Displacement of mixture or other fault shall be corrected at once by use of rakes and application of fresh mixture or removal of mixture, as required. Rolling of each course shall be continued until roller marks are eliminated. Roller shall pass over unprotected edge of course only when paving is to be discontinued for sufficient time to permit mixture to become cold.
- J. In places not accessible to roller, mixture shall be compacted with hand tampers. Hand tampers shall weigh at least 50 lb. and shall have a tamping face less than or equal to 100 sq. in. Mechanical tampers capable of equal compaction will be acceptable in areas in which they can be employed effectively.
- K. Portions of pavement courses which become mixed with foreign material or are in any way defective shall be removed, replaced with fresh mixture, and compacted to density of surrounding areas. Asphaltic material spilled outside lines of finished pavement shall be immediately and completely removed. Such material shall not be employed in the work.
- L. Joints shall present same texture, density, and smoothness as other sections of the course. Continuous bond shall be obtained between portions of existing and new pavements and between successive placements of new pavement. New material at joints shall be thick enough to allow for compaction when rolling. Compaction of pavement, base, and subgrade at joints shall be such that there is no yielding of new pavement relative to existing pavement when subjected to traffic.
- M. Contact surfaces of previously constructed pavement (if greater than or equal to seven days since binder placed), manholes, and similar structures shall be thoroughly cleaned and painted with a thin uniform coating of bitumen immediately before fresh mixture is placed. Tack coat shall be applied at rate which will leave asphaltic residue of 5 to 7 gal./100 yd.2 after evaporation of vehicle. Base surface shall be dry and clean when tack coat is applied. Asphaltic paving material shall not be placed until vehicle has completely evaporated from tack coat. Adjoining new paving shall be placed before tack coat has dried or dusted over.

- N. Earth or other approved material shall be placed along pavement edges in such quantity as will compact to thickness of course being constructed, allowing at least 1 ft. of shoulder width to be rolled and compacted simultaneously with rolling and compacting surface. Pavement edge shall be trimmed neatly to line before placing earth or other approved material along edge.
 - 1. After final rolling, vehicular traffic shall not be permitted on pavement until it has cooled and hardened, and in no case less than six hours.
- O. Variations in smoothness of finished surface shall be less than or equal to the following tolerances when tested with a 10 ft. straightedge, applied both parallel to and at right angles to centerline of paved area.
 - 1. For sidewalk pavement surface course - 1/4 in. in 10 ft.
 - 2. At joint with existing pavement, and at other locations where an essentially flush transition is required, pavement elevation tolerance shall not exceed 0.01 ft.
 - 3. At other areas pavement elevation tolerance shall not exceed + 0.05 ft.
 - 4. Irregularities exceeding these amounts or which retain water on surface shall be corrected by removing defective work and replacing with new material conforming to this Section.

3.4 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.5 REPAIRS TO EXISTING PAVEMENT

- A. Subgrade shall be done in strict accordance with Paragraph 3.01, above.
- B. Aggregate base course shall be replaced in strict conformance with Paragraph 3.02, above.
- C. Asphaltic concrete paving mixture, equipment, and methods of mixing and placing shall conform to MHD Specifications Section 472 for Bituminous Concrete for Patching, and Paragraph 3.03, above.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.
 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements

3.7 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
 1. Do not allow excavated materials to accumulate on-site.

END OF SECTION

SECTION 321313

PORTLAND CEMENT CONCRETE PAVING

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Contract Documents:

1. Work requirements are contained in Contract Documents and include cross-references to published information, which are not necessarily bound as part of this Project Manual.
2. Drawings and General Provision of the Contract, including General and Supplementary Conditions, and other Division 1 Specification Sections, apply to work and all Specification Sections of this Project.

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: Portland cement concrete paving work including aggregate base course and detectable warning surfaces in accordance with the Drawings and Specifications.
- B. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council. Refer to Section 018110, SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING
 2. Section 079200, EXTERIOR SEALANTS
 3. Section 321216.1, BITUMINOUS CONCRETE PAVING

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 1. American Concrete Institute (ACI):

305R Hot Weather Concreting

306R	Cold Weather Concreting
325.9R	Guide for Construction of Concrete Pavements and Concrete Bases

2. American Society for Testing and Materials (ASTM):

A 185	Welded Steel Wire Fabric for Concrete Reinforcement
C 33	Concrete Aggregates
C 94	Ready-Mixed Concrete
C 143	Slump of Portland Cement Concrete
C 150	Portland Cement
C 171	Sheet Materials for Curing Concrete
C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
C 309	Liquid Membrane-Forming Compounds for Curing Concrete
C 494	Chemical Admixtures for Concrete
C 920	Elastomeric Joint Sealants
C 962	Guide for Use of Elastomeric Joint Sealants
D 226	Asphalt-Saturated Organic Roofing Felt for Use in Membrane Waterproofing and Built-Up Roofing
D 1557	Moisture - Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54-kg) Rammer and 18-in. (457 mm) Drop
D 1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

3. Americans with Disabilities Act (ADA):

Appendix to Part 1191	Accessibility Guidelines for Buildings and Facilities
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4. Commonwealth of Massachusetts Highway Department (MHD):

Specifications	Standard Specifications for Highways and Bridges
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1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. ACI Publications: Unless otherwise specified, work and materials for construction of the Portland cement concrete paving shall conform to ACI 325.9R.

- C. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.
 - 1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete producer.
- E. Work, materials, and color of the handicap ramp paving shall conform to applicable sections of Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.
- F. Paving work, base course etc., shall be done only after excavation and construction work which might damage them have been completed. Damage caused during construction shall be repaired before acceptance.
- G. Existing paved areas shall, if damaged or removed during course of this project, be repaired or replaced under this section of the specification. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work.
- H. Pavement, base, or subbase shall not be placed on a muddy or frozen subgrade.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

1.7 PRECONSTRUCTION MOCK-UP PANELS

- A. General
 - 1. Schedule mock-up casting for acceptance 30 days prior to casting of concrete surfaces represented by the mockups.
 - 2. Locate mock-up panels in close proximity to existing concrete sidewalk to remain exact area to be accepted by the Architect.
 - 3. Continue to cast mock-ups until acceptable mock-ups area produced. Accepted mock-ups shall be the standard for color, texture, and workmanship for the work.
 - 4. Mock-up sequence of forming, placing, form removal, curing, and finishing shall be reviewed and accepted by the Architect.
 - 5. Mock-up formwork shall be inspected and accepted by the Architect before placing of concrete.

6. Use the same concrete mixes and placement procedures, accepted in mock-ups, in the final work, unless otherwise directed by the Architect.
 7. Protect accepted mock-ups from damage until completion and acceptance of the work represented by the mock-up.
 8. Remove mock-up panels from site at completion of project, as directed by the Architect.
- B. Construct mock-up panels or areas as indicated to demonstrate the ability to cast concrete for concrete paving to achieve shape, color, jointing and textured finish required. Mock-ups shall include or meet the following requirements:
1. Provide mock-up panel 5 ft. x 10 ft. size, full depth.
 2. Provide mock-ups simulating actual design and execution conditions for concrete mix materials, reinforcement, formwork, placing sequence, form removal, curing, finishing, and methods and materials of stain removal and correction of defective work.
 3. On mock-ups where directed by the Architect, provide minimum of three variation of mix color to be used in the repair of defective work, in order to determine acceptable color and texture match.
 4. Demonstrate in the construction of the mock-up formwork the sealer material, form release agent, and curing materials and methods to be used.
 5. Include control joints and expansion joints with joint sealer.
 6. Provide minimum of three surface finishes, including "broom finish", "exposed aggregate", and "sandblast finish" in order to determine acceptable texture.
- C. Source of Materials. Utilize the same source, stock, or brand of concrete materials for each class or mix of concrete which is to be exposed. Do not interchange materials or mixes until an additional mock-up shows that uniformity in finish texture and color, as compared to original mock-up will be maintained. If necessary, obtain and stockpile materials in sufficient quantity to ensure continuity and uniformity.

1.8 SUBMITTALS

- A. Description of Methods and Sequence of Placement. For each type of specially-finished concrete provide description of methods and sequence of placement.
- B. Submit manufacturer's product data for the following:
 1. Form release agent.
 2. Prefomed joint filler.
- C. Submit samples of the following:
 1. Prefomed joint filler.
- D. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- E. Material Certificates: Signed by manufacturers certifying that each of the following

materials complies with requirements:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Bonding agent or epoxy adhesive.

F. Minutes of preinstallation conference.

1.9 TESTING AND INSPECTION

- A. Contractor shall provide a minimum of four (4) test results indicating compliance with minimum compressive strength requirements of fully cured concrete pavement
- B. The Owner reserves the right to inspect and test paving and associated work in accordance with Section 014000, QUALITY REQUIREMENTS.

PART 2 – PRODUCTS

2.1 DENSE GRADED BASE COURSE

- A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.

1. Material shall be dense graded crushed stone conforming to MHD Specifications Section M2.01.7.

2.2 PORTLAND CEMENT CONCRETE

- A. Portland cement concrete for pavements and slabs shall be air-entrained type with a maximum water-cement ratio of 0.50 conforming to ACI 325.9R. Minimum compressive strengths at 28 days shall be 4,000 psi.

1. Concrete shall be air-entrained type, conforming to ASTM C 94. Air content by volume shall be 6% + 1%, and shall be tested in accordance with ASTM C 231.
2. Concrete slump shall be no less than 3 in. nor greater than 5 in., determined in accordance with ASTM C 143.
3. Cement shall be Portland cement, conforming to ASTM C 150, Type I or II. Only one color of cement, all of the same manufacturer, shall be used for the work. Type III cement shall be used only with the prior approval of the Architect.
4. Fine and coarse aggregates shall conform to ASTM C 33.
5. Concrete shall contain a water reducing agent to minimize cement and water content of the concrete mix at the specified slump. Water reducing agent shall conform to ASTM C 494.
6. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixtures other than those specified shall be used in the concrete without

the specific written permission of the Architect in each case.

2.3 CHEMICAL ADMIXTURES

- A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.

2.4 CURING MATERIALS FOR UNCOLORED CONCRETE

- A. Curing shall be by moist curing or by use of curing compound.
- B. Curing paper shall be a nonstaining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.
- C. Water: Potable.
- D. Curing compound shall be a clear compound conforming to ASTM C 309, Type 1 or white pigmented compound conforming to ASTM C 309 Type 2, Class B.

2.5 EXPANSION JOINTS

- A. Unless otherwise indicated on the Drawings, expansion joints shall be located 30 ft. o.c., maximum.
- B. Expansion joint filler shall be preformed, non-bituminous type joint filler conforming to ASTM D 1752, Type II, similar to Sealtight Cork Expansion Joint Filler, manufactured by W.R. Meadows, Inc., Elgin, IL 60120, or approved equal.
 - 1. Premolded filler shall be one piece for the full depth and width of the joint leaving a sealant recess as indicated.
 - 2. Use of multiple pieces of lesser dimensions to make up required depth and width of joint will not be permitted.
 - 3. Except as otherwise noted on the Drawings, joint filler shall be 3/8 in. thick.
- C. Dowels shall be furnished under this Section, and shall be Type 304 stainless steel.

2.6 SEALANT

- A. Sealant for sealing of expansion joints in concrete walks shall be a two component polyurethane based sealant conforming to Section 079200, EXTERIOR SEALANTS.

2.7 CONTROL JOINTS

- A. Control joints indicated on the Drawings to be sawn, shall be made by saw cutting concrete slab after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab. Saw blade shall cut into slab at least 1 in., but in no case less than 25% of slab depth.

- B. Unless otherwise indicated on the Drawings, control joints shall be located 10 ft. o.c. maximum.

2.8 CONSTRUCTION JOINTS

- A. Transverse construction joints shall be placed whenever placing of concrete is suspended for more than 30 minutes.
 - 1. Butt joint with dowels or thickened edge joint shall be used if construction joints occurs at location of control joint.
 - 2. Keyed joints with tiebars shall be used if the joint occurs at any other location.

2.9 DETECTABLE WARNING PLATES

- A. Detectable Warning Plates (DWP) Iron Cast: Castings shall be DURALAST with interlocking plates or approved equal. The castings shall contain truncated domes that meet the requirements of Americans with Disabilities Act Accessibility Guidelines (ADAAG) for Accessible Public Rights-of-Way, Section R304 – Detectable Warning Surfaces. Castings shall have an integral non-slip texture on and between the truncated dome shapes.
 - 1. Material: Manufacturer shall certify that all castings conform to either Gray Iron ASTM A48 Class 35 B and/or AASHTO M105, Class 35B gray iron and/or ASTM A536 Ductile Iron. Castings must contain a minimum of 85% recycled content.
 - 2. Sizes: Shall be Manufacturer's standard sizes, as indicated on the drawings.
 - 3. Pattern shall consist of raised truncated domes of height and diameter as specified in ADA Guideline 4.29.2.

2.10 GROUT

- A. Grout shall be mixed in the proportions of one part Portland cement to two parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Sand for grout shall be "Fine Aggregate", conforming to ASTM C 33.
- B. Non-shrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRD-C 621 (558). Grout permanently exposed to view shall be non-oxidizing; metallic grout may be used in other locations.

- 1. Non-shrink grout shall be one of the following, or approved equal:

Manufacturer	Product
Gifford-Hill Co.	Supreme
Master Builders Co.	Embeco
U.S. Grout Corporation	Five Star Grout

2.11 BOND BREAKER

- A. Bond breaker shall be asphalt felt conforming to ASTM D 226, Type I or 6 mil polyethylene sheeting.

PART 3 – EXECUTION

3.1 GRADING

- A. Areas to be paved will be compacted and brought approximately to subgrade elevation under Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.
- B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING.
- C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below aggregate base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.
- D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING. Completed subgrade after filling such areas shall be uniformly and properly graded.
- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.
- F. Materials shall not be stored or stockpiled on subgrade.
- G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following:
 - 1. Material shall be legally disposed of off-site.
- H. Prepared subgrade will be inspected and tested by an independent testing agency, provided and paid for by the Contractor, prior to installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.
 - 1. Contractor shall submit a minimum of six (6) Proctor compaction test results indicating conformance to compaction density requirements specified herein.

3.2 AGGREGATE BASE COURSE

- A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of

this type for first class road work, and the following:

1. MHD Specifications Section 405, "Gravel Base Course".
- B. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 in. shall be excluded from course.
- C. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.
- D. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton steel wheel roller or vibratory roller equivalent to a 6 ton static roller, or an approved equivalent.
 1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
 2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
 3. Surface irregularities which exceed 1/2 in. measured by means of a 10 ft. long straightedge shall be replaced and properly compacted.
- E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.
- F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.3 PORTLAND CEMENT CONCRETE PAVING

- A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base etc., shall meet the requirements of ACI 325.9R. Pavement shall be constructed in accordance with the Drawings.
- B. The Architect shall be notified of concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary inspection of the work, including subgrade, forms, and reinforcing steel, if used.
- C. Normal concrete placement procedures shall be followed. Concrete shall arrive at the jobsite so that no additional water will be required to produce the desired slump. When conditions develop that required addition of water to produce the desired slump, permission of the Architect must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material.
- D. Work shall not be performed during rainy weather or when temperature is less than 40o F. (4.4o C).

- E. Adjacent work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original conditions.
- F. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall thoroughly damp when concrete is placed. There shall be no free water on surface.
- G. Concrete which has set or partially set before placing shall not be employed. Retempering of concrete will not be permitted.
- H. Concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.
- I. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 in. thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.4 FINISHING

- A. Concrete flatwork surfaces shall be screeded off, bullfloated, power or hand floated, troweled and finished true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.
 - 1. Finished concrete surface for subbases shall be woodfloated to a slightly rough surface. Surface shall not deviate more than 1/4 in. in 10 ft.
 - 2. Finished concrete surface for exposed concrete walks, ramps and pads shall be wood-floated and steel troweled to a smooth surface, or lightly sandblasted as indicated on the Drawings. Surface shall not deviate more than 1/8 in. in 10 ft.
- B. Unless otherwise indicated, horizontal surfaces of concrete surfaces which will be exposed shall be given one of three finishes approved by the Architect as displayed in the accepted mockup:
 - 1. A light broomed finish: with direction of grooves in concrete surface perpendicular to length of concrete band, slab, or pad. After concrete has set sufficiently to prevent coarse aggregate from being torn from surface, but before it has completely set, brooms shall be drawn across it to produce a pattern of small parallel grooves. Broomed surface shall be uniform, with no smooth, unduly rough or porous spots, or other irregularities. Coarse aggregate shall not be dislodged by brooming operation.
 - 2. Exposed aggregate finish to match older concrete on adjacent concrete.
 - 3. Light Brush Blast Finish: Provide light brush blast finish lightly exposing fine aggregate with no reveal, as on Architect's sample panel, approved sample, and mockup installation. Finish shall be free of surface defects such as migrated entrained air or entrapped air bubbles over 1/8 in. diameter, sand streaks, staining, lack of uniformity of color or finish, blotches, wash, form leakage or honeycomb, and physical damage, any of which shall be deemed cause for rejection.
- C. Immediately following finishing operations, arrises at edges and both sides of expansion joints shall be rounded to a 1/8 in. radius.

- D. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

3.5 CURING

- A. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.
- B. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.
 1. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period surface shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.
 2. If concrete is cured with a curing compound, compound shall be applied at a rate of 200 sq. ft. per gallon, in two applications perpendicular to each other.
 3. Curing period shall be seven days minimum.

3.6 CONSTRUCTION JOINTS

- A. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 2. Provide tie bars at sides of pavement strips where indicated.
 3. Butt Joints: Use epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.7 EXPANSION JOINTS

- A. Expansion joints (isolation joints) shall be 3/8 in. wide and unless otherwise indicated on the Drawings, shall be located 30 ft. o.c. and at places where pavement meets other structures. Expansion joint shall be formed in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full width and depth of the slab. Joint filler shall extend the full length of the expansion joint.
 1. Depth of joint filler shall be as required to form a 1-1/4 in. deep sealant and backer rod recess below finished concrete surface.

2. Doweled Joints: Install sleeves and dowel bars at expansion joints as indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONTROL JOINTS

- A. Control joints indicated to be sawn shall be sawn $\frac{1}{4}$ in. wide by using a diamond blade soff-type early entry cut saw. Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab. Saw shall cut into slab at least 1 in., but in no case less than 25% of slab depth.

3.9 DETECTABLE WARNING SURFACE INSTALLATION

- A. During Cast In Place Detectable Warning Surface Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- B. Prior to placement of the Cast In Place Detectable Warning Surface Tile system, review manufacturer and contract drawings with the Contractor prior to the construction and refer any and all discrepancies to the Engineer.
- C. The specifications of the structural embedment flange system and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers. Not recommended for asphalt applications.
- D. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4 - 7 to permit solid placement of the Cast In Place Detectable/Tactile Warning Surface Tile system. An overly wet mix will cause the tile to float. Under these conditions, suitable weights such as 2 concrete blocks or sandbags (25 lb) shall be placed on each tile.
- E. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast In Place Detectable/Tactile Warning Surface Tile system. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.
- F. The factory-installed plastic sheeting must remain in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.
- G. When preparing to set the tile, it is important that no concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.
- H. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed true and square to the curb edge in accordance with the contract drawings. The Cast In Place Detectable/Tactile Warning Surface Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The embedment process should not be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. The contract drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and

eliminate tripping hazards between adjacent finishes.

- I. In cold weather climates it is recommended that the Cast In Place Detectable/Tactile Warning Surface Tiles be set deeper such that the top of domes are level to the adjacent concrete on the top and sides of ramp and that the base of domes to allow water drainage. This installation will reduce the possibility of damage due to snow clearing operations.
- J. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates. Ensure that the field surface of the tile is flush with the surrounding concrete and back of curb so that no ponding is possible on the tile at the back side of curb.
- K. While concrete is workable, a 3/8" radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.
- L. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external forces placed on the tile that may rock the tile causing a void between the underside of tile and concrete.
- M. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each may be required to be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.
- N. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brush will clean the residue without damage to the tile surface.

3.10 COLD WEATHER CONCRETING

- A. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40oF. or is expected to fall to below 40oF. within 72 hours, and the concrete after placing shall be protected by covering, heat, or both.
- B. Details of handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Architect. Procedures shall be in accordance with provisions of ACI 306R.

3.11 HOT WEATHER CONCRETING

- A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. Every effort shall be made to minimize delays which will result in excessive mixing of the concrete after arrival on the job.
- B. During periods of excessively hot weather (95oF., or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 95oF., when ready for placement will not be acceptable, and will be rejected.
- C. Temperature records shall be maintained throughout the period of hot weather giving

air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. Records shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

3.12 SEALING OF JOINTS

- A. Where indicated on the Drawings, expansion joints and control joints shall be sealed with joint sealant in accordance with Section 079200, EXTERIOR SEALANTS.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- D. In-Place Density:
 - 1. In-place density of compacted pavement will be determined by testing core samples according to ASTM C 42.

- a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
 - E. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 - F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 - G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
 - H. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
 - I. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 3.14 PROTECTION OF CONCRETE SURFACES
- A. Concrete surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary 1/2 in. thick plywood sheets shall be used to protect the exposed surface.
 - B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

END OF SECTION

SECTION 321723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Contract Documents:

1. Work requirements are contained in Contract Documents and include cross-references to published information, which are not necessarily bound as part of this Project Manual.
2. Drawings and General Provision of the Contract, including General and Supplementary Conditions, and other Division 1 Specification Sections, apply to work and all Specification Sections of this Project.

1.2 WORK INCLUDED

- ###### A.
- Without limiting the generality thereof, the scope of work under this Section shall include all labor, materials, accessories, service, and equipment necessary to furnish and apply all pavement striping, parking stalls, and accessible space graphics as indicated on the Drawings and as specified herein.

1.3 RELATED WORK

- ###### A.
- The following is a list of related work items that shall be performed or furnished under other Sections of these Specifications as indicated:
1. Section 321216, BITUMINOUS CONCRETE PAVING.

1.4 REFERENCES

- ###### A.
- General Requirements Division 1 apply to this Section.
- ###### B.
- Refer to other Divisions of these Specifications, other Sections in this Division, and Drawings for related work which may affect the work of this Section.
- ###### C.
- The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work.
- ###### D.
- "The Standard Specification" shall refer to The Massachusetts Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

1.5 SUBMITTALS

- ###### A.
- Submit paint manufacturer and application instructions for review and approval prior to ordering material.

1.6 QUALITY ASSURANCE

- A. Contractor is to furnish the Owner with a 1-year unconditional guarantee against fading, chipping, peeling, wearing, etc., for said 1-year period. The Contractor is to provide said guarantee in writing, in a form acceptable to the Owner's representative, with the bid.

PART 2 - PRODUCTS

2.1 PAINT

- A. All paint for parking stall and traffic markings shall be fast-drying white traffic paint complying with the applicable paragraphs of Section 627, Pavement Markings, of the Standard Specifications.
- B. The name of the manufacturer shall be submitted to the Owner's representative together with an affidavit stating material does comply with the above-noted specification. Material shall be used in accordance with the Standard Specifications, but shall not be installed until the top course of pavement has cured at least a week. No reflective glass beads will be required.
- C. The material shall not lift from the pavement in freezing weather, and shall not smear or spread under normal traffic conditions or at temperature below 120 degrees F.
- D. The paint shall not deteriorate by contact with sand, sodium, chloride, calcium chloride, or other chemicals used against the formation of ice on the pavement, because of the oil content of pavement materials, or from gasoline, grease, and oil drippings from vehicles.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Pavement striping and marking shall be applied in accordance with this Specification and the Drawings. See Drawings for layout and additional notes. No paint shall be applied until the top pavement course has cured at least one week minimum.
- B. Stripe all parking stalls as shown on the Drawings accurately and paint all parking stall striping in white 4-inch-wide single stripes. Striping, symbols, and arrows shall be painted to the size, length, and spacing as specified and indicated on the Drawings.
- C. Stripe all basketball court markings as shown on the Drawings accurately and paint all basketball court markings in white, 2-inch wide single stripes.
- D. All stripes shall be applied one coat with brush, spray, or marking machine over dry, clean pavement only.
- E. All paint shall be installed at a rate of not more than 300 linear feet of 4-inch-wide lines per gallon of paint (approximately 0.016-inch dry film thickness).
- F. Furnish only skilled workmen who are experienced and normally employed in the work of installing traffic lines. Supply all the necessary equipment and materials for the installation of the traffic lines.

- G. If material is applied to the pavement by an extrusion method, one side of the shaping die shall be the pavement and the other three sides are contained by, or are part of, suitable equipment for controlling the flow of paint.
- H. All stalls shown on the plan are to be spaced equally, each stall being separated from the next as indicated on the Drawings. The line indicated on the Drawings is on the center line of the stall striping. The line between rows of stalls shall be a single line.
- I. Where entire areas are to be cross-hatched as directed by the Drawings, the 4-inch-wide straight white parallel stripes 36 inches o.c. shall be laid out and painted in solid lines.
- J. After application and proper drying time, the material shall show no appreciable deformation or discoloration under traffic conditions and in air and/or road temperature ranging from 0 degrees F to 120 degrees F.
- K. The stripe shall maintain its original dimensions and placement. The exposed surface shall be free from tack. Cold ductility of the material shall be such as to permit normal movement with the pavement surface without chipping or cracking.
- L. Contractor shall clean and sweep all areas to be striped or restriped of all sand, dirt, grease, oil, etc., as required so as to produce a first-class job. By proceeding, the striping Contractor agrees surface is satisfactory to produce the required first-class job and 1-year guarantee described.
- M. The Contractor shall protect the building, walks, pavement, curbing, trees, shrubs, mulch, etc. from over-spray of paint and damage by his operations.
- N. Traffic shall not be permitted on the pavement until the paint is thoroughly dry.

END OF SECTION

SECTION 329200

LAWNS AND GRASSES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Contract Documents:

1. Work requirements are contained in Contract Documents and include cross-references to published information, which are not necessarily bound as part of this Project Manual.
2. Drawings and General Provision of the Contract, including General and Supplementary Conditions, and other Division 1 Specification Sections, apply to work and all Specification Sections of this Project.

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: the seeding and sodding of lawns, including furnishing and placing planting soil, as indicated on the Drawings and as specified.
- B. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council. Refer to Section 018110, SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
1. Section 312300, SITE EXCAVATING, BACKFILLING AND COMPACTING; Establishment of subgrade elevation.
 2. Section 329119, LANDSCAPE GRADING.
 3. Section 329300, TREES, PLANTS AND GROUND COVERS.

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. American Society for Testing and Materials (ASTM):
 - C 136 Sieve Analysis of Fine and Coarse Aggregates
 - D 422 Particle-Size Analysis of Soils
 - E 11 Wire-Cloth Sieves for Testing Purposes

1.5 SUBMITTALS

- A. Samples: The following samples shall be submitted:
- | Material | Quantity (lb.) |
|------------|----------------|
| Fertilizer | 1 |

Lime	1
Compost	1
Seed, each mix	1
Loam borrow	1

- B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials: Fertilizer
- C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials:
 - Commercial fertilizer
 - Grass seed mixes
 - Ground limestone

1.6 OWNER'S INSPECTION AND TESTING

- A. Work will be subject to inspection at all times by the Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of Section 014320, QUALITY CONTROL AND TESTING SERVICES to analyze and test materials used in the construction of the work. Where directed by the Architect, the testing laboratory will make material analyses and will report to the Architect whether materials conform to the requirements of this specification.
 - 1. Cost of tests and material analyses made by the testing laboratory will be borne by the Owner when they indicate compliance with the specification, and by the Contractor when they indicate non-compliance.
 - 2. Testing equipment will be provided by and tests performed by the testing laboratory. Upon request by the Architect, shall provide such auxiliary personnel and services needed to accomplish the testing work.
 - 3. Gradation of granular materials shall be determined in accordance with ASTM C 136. Sieves for determining material gradation shall be as described in ASTM E 11.

1.7 CONTRACTOR'S INSPECTION AND TESTING

- A. The Contractor shall engage an independent testing agency, experienced in the testing of agricultural soils and acceptable to the Architect, to perform the topsoil/planting soil tests and analyses specified herein. All costs associated with testing shall be the Contractor's responsibility.
 - 1. Particle size analysis shall include the following gradient of mineral content:

USDA Designation	Size in mm
Gravel	+ 2 mm
Very coarse sand	1-2 mm
Coarse sand	0.5-1 mm
Medium sand	0.25-0.5 mm
Fine sand	0.1-0.25 mm
Very fine sand	0.05-0.1 mm
Silt	0.002-0.05 mm
Clay	< 0.002 mm
 - 2. Chemical analysis shall include the following:
 - a. pH and buffer pH.

- b. percentage of organic content by oven-dried weight. Nutrient levels by parts per million, including phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium.
- c. Nutrient test shall include testing laboratory recommendations for supplemental additions to the soil, if necessary, based on the requirements for ornamental horticultural plants. Recommendations shall include rates at which additives are to be applied.
- d. Soluble salt by electrical conductivity of a 1:2 soil/water sample. .

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver seed in original sealed containers, labeled with analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, location of packaging, and name of seed grower. Damaged packages will not be accepted.
- B. Seed shall be stored under cool and dry conditions so that the endophytic seed in the mixture is capable of maintaining a high level of endophytes.
- C. Deliver fertilizer in sealed waterproof bags, printed with manufacturer's name, weight, and guaranteed analysis.

1.9 PLANTING SEASON

- A. Planting season shall be as follows:
 - Seeding and sodding
 - Spring: 3/15 to 5/15
 - Fall: 8/15 to 10/15
- B. Planting shall only be performed when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.
- C. Planting season may be extended with the written permission of the Architect.

1.10 ACCEPTANCE

- A. Acceptance:
 - 1. The Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
 - 2. Acceptance of material by the Architect will be for general conformance to specified requirements, and shall not relieve the Contractor of responsibility for full conformance to the Contract Documents.
 - 3. Upon completion and reinspection of all repairs or renewals necessary in the judgement of the Architect, the Architect will recommend to the Owner that the work of this Section be accepted.
- B. Seed areas will be accepted when in compliance with all the following conditions:
 - 1. All areas show a uniform stand of specified grass in healthy condition
 - 2. At least 60 days have elapsed since the completion of work under this Section

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials shall be extracted or recovered and manufactured from within 500 miles of project site.

2.2 LAWN SEED

- A. Seed mixture: Standard grade seed of the most recent season's crop. Seed shall be dry and free of mold. Seed shall be inoculated with endophytes. Seed mixture shall be as follows: SEED MIX

<u>Name of Seed</u>	<u>% by Weight in Mixture</u>	<u>Minimum % Purity</u>	<u>Minimum % Germination</u>
Certified Julia, Dawn Or Shamrock Kentucky Bluegrass	40	98	99
Shademaster Creeping Red Fescue	40	98	85
Commander Perennial Ryegrass	20	90	80

2.3 LAWN PLANTING SOIL

- A. Existing Topsoil

- 1. Existing topsoil from on-site source(s) may be used for planting soil, to the extent available, if it meets the requirements of this Section for planting soil, or if approved by the Architect.

- B. Planting Soil

- 1. Planting soil shall be composed of a natural, fertile, friable soil typical of cultivated topsoils of the locality, suitable for the germination of seeds and support of vegetative growth, with additives, if required, to achieve particle distribution and organic content specifications. Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances. Planting soil shall have a pH value between 5.5 and 6.5 and organic matter content of 5 to 10% of total dry weight.

- 2. Planting soil shall have the following mechanical analysis (see paragraph 1.6 for particle sizes):

<u>Approximate Particle Distribution</u>	
Gravel	Less than 10%
Coarse to medium sand	55 – 65%
Fine to very fine sand	15 – 25%
Silt	10– 20%
Clay	15 – 20%

- 3. Minimum planting soil nutrient levels shall be: Nitrogen @ 5% average of organic matter, Phosphorus @ .02 to .05% average of total soil content, Potassium @ 1.2% average of total soil content.

4. The Contractor shall provide the Architect with planting soil test results, as specified in Paragraph 1.6, before the start of planting operations. If planting soil does not fall within the required particle distribution, organic content, or pH range, it shall be adjusted to meet the specifications through the addition of sand, compost, limestone, or aluminum sulfate to bring it within the specified limits.

2.4 COMPOST

- A. Compost shall be derived from organic wastes such as food and agricultural residues, animal manures, mixed solid waste and biosolids (treated sewage sludge) that meet all State Environmental Agency requirements. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth.

1. Compost shall have the following properties:

Parameters	Range
pH	5.5 – 8.0
Moisture Content	35% - 55%
Soluble Salts	less than or equal to 4.0 mmhos (dS)
C:N ratio	15 – 30:1
Particle Size	< 1"
Organic Matter Content	> 50%
Bulk Density	< 1000 lbs./cubic yard
Foreign Matter	< 1% (dry weight)

2. Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements.
3. Compost shall be "AllGro", distributed by AllGro, 4 Liberty Lane West, Hampton, NH 03842; "Agresoil", distributed by Agresource, 100 Main Street, Amesbury, MA 01913; or approved equal.
4. Guidelines for quantity of compost required to achieve suitable soil organic content in soil mixes for ornamental horticultural planting shall be as recommended by the compost manufacturer

2.5 LIMESTONE

- A. Ground limestone shall be an agricultural limestone containing a minimum of 85% total carbonates, by weight. Ground limestone shall be graded within the following limits:

Sieve Size	% Passing by Weight
No. 10	100
No. 20	90
No. 100	60

2.6 WATER

- A. Water shall be suitable for irrigation and free from ingredients harmful to seeded or sodded areas.

2.7 COMMERCIAL FERTILIZER

- A. Starter fertilizer shall be HD Scotts Starter Fertilizer or approved equal.
- B. Fertilizer shall conform to the following:

1. When applied as a topsoil amendment, fertilizer shall have an analysis that will deliver appropriate amounts of nitrogen, phosphorus, and potassium as required to remedy deficiencies revealed by testing the topsoil.
 - a. 50% of nitrogen shall be derived from natural organic source of ureaform .
 - b. Available phosphorus shall be derived from superphosphate, bone meal, or tankage.
 - c. Potassium shall be derived from muriate of potash containing 60% potash.

- C. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.

2.8 SUPERPHOSPHATE

- A. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes, and containing not less than 20% available phosphoric acid. The superphosphate shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any superphosphate which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.

2.9 CELLULOSE FIBER MULCH

- A. Cellulose fiber mulch shall be composed of virgin wood, contain a green color additive, be weed free, and non-polluting, containing no germination or growth - inhibiting factors, similar to Hydro Mulch, manufactured by Conwed Corporation, St. Paul, Minnesota 55113.

2.10 WEED CONTROL

- A. Weed control for stockpiled topsoil shall be a non-selective weed killer for control of grassy and broadleaf weeds; weed control shall have short residual, allowing seeding and sodding operations to occur within 7 days of application.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

- A. Subgrade shall be examined to ensure that rough grading and all other subsurface work in lawn areas and other areas to be seeded or sodded is done prior to start of seeding or sodding.
- B. Existing subgrade shall be loosened or scarified to a minimum depth of 3 in. prior to spreading topsoil. Subgrade shall be brought to true and uniform grade, and shall be cleared of stones greater than 3 in., sticks, and other extraneous material.

3.2 SPREADING OF PLANTING SOIL

- A. Planting soil shall not be spread until it is possible to follow immediately or within 24 hours with seeding or sodding operations. If topsoil is spread prior to this time it shall be cultivated to loosen soil prior to seeding or sodding.
- B. Planting soil shall not be placed when subgrade or topsoil material are frozen, excessively wet, or excessively dry.

- C. Planting soil shall be spread in a uniform layer, to a thickness which will compact to the depth required to bring final lawn and grass surfaces to required elevation. Unless otherwise indicated minimum depth of topsoil for seeded and sodded areas shall be 6 in.
 - 1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
- D. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.
- E. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.3 APPLICATION OF FERTILIZER AND CONDITIONERS

- A. Fertilizer and conditioners shall be applied at the following rates:
 - 1. Compost - as required by test results of topsoil.
 - 2. Limestone - as required by test results of topsoil.
 - 3. Fertilizer - as required by test results of topsoil.
- B. Mixing with planting soil:
 - 1. Fertilizer and conditioners shall be spread over the entire lawn areas at the application rates indicated above.
 - 2. Materials shall be uniformly and thoroughly mixed into the top 4 in. of planting soil by discing, rototilling, or other approved method.

3.4 FINISH GRADING

- A. Refer to Section 329119, LANDSCAPE GRADING.
- B. Contractor shall set grade lines for Architect's review and approval.
 - 1. Final surface of topsoil immediately before seeding and sodding shall be within + 1/2 in. of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can collect. Stones, roots, and other debris greater than 1 in. in any dimension, which are visible at the surface, shall be removed and the resulting holes filled with topsoil, leaving a uniform planar surface.
- C. Finish grade surface with a drag or rake. Round out all breaks in grade, smooth down all lumps and ridges, fill in all holes and crevices. Rolling with a light roller is acceptable, if the surface is scarified afterward.
 - 1. Lawn: Compaction of topsoil for finish grade shall be 85% to 88%.
- D. In the event of settlement, the Contractor shall readjust the work to required finished grade.

3.5 LAWN SEED APPLICATION

- A. Seed shall be applied in two applications; by mechanical spreader.
- B. First Application: Seed shall be broadcast by means of an approved mechanical spreader, to give a uniform application at the following rates:
- | <u>Seed Application</u> | <u>Rate lb./1,000 s.f.</u> |
|-------------------------|---|
| Seed Mixture | 4.0 (unless otherwise recommended by seed supplier) |
1. Seed shall be applied in two equal applications for uniform coverage; direction of travel of spreader for second pass shall be perpendicular to that of the first pass. Seeding shall not be done when it is raining or snowing, or when wind velocity exceeds 5 mph.
2. Following seeding the area shall be lightly raked to mingle seed with top 1/8 to 1/4 in. of soil. Area shall then be fine graded. Stones and other debris greater than 1 in. in any dimension which are visible on surface shall be removed.
- C. Following seeding and raking, entire area shall be rolled with a hand roller having a weight of 60 to 90 lb./ft. of width, and a minimum diameter of 2 ft. Entire area shall then be watered by use of lawn sprinklers, or other approved means. Initial watering shall continue until the equivalent of a 2 in. depth of water has been applied to entire seeded surface, at a rate which will not dislodge the seed. Watering shall be repeated thereafter as frequently as required to prevent drying of the surface, until the grass attains an average height of 1/4 in. Watering methods and apparatus which may cause erosion of the surface shall not be permitted.
- D. Rope off entire seeded area to prevent vehicles and pedestrians from entering area.

3.6 CONTRACTOR MAINTENANCE

- A. Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:
- Fertilizing
 - Mowing
 - Replanting
 - Watering
 - Weeding
- B. Maintenance of seeded areas shall begin upon completion of seeding and shall continue until acceptance of the building, or until mowing as specified below is completed, or until average height of grass is 1-1/2 in., whichever occurs later.
1. Watering
- a. Week No. 1: Provide all watering necessary to keep seed bed moist at all times. Perform watering daily or as necessary to maintain moist soil to a depth of 4 in.
 - b. Week No. 2 and until acceptance of the building, or until mowing as specified below is completed, or until average height of grass is 1-1/2 in., whichever occurs later: Water as necessary to maintain adequate moisture in the upper 4 in. of soil to promote seed germination.
2. Mowing

- a. Not more than 40% of the grass leaf shall be removed during the first or subsequent mowings.
 - b. Bluegrass and other cool season grasses shall be maintained between 1-1/2 in. and 2-1/2 in.
 - c. All clippings shall be removed.
- C. After grass has sprouted, seeded areas which fail to show a uniform stand of grass shall be replanted as often as necessary to establish an acceptable stand of grass.
- 1. Scattered bare spots, shall not exceed 15 sq. in. Each.
- D. Weeds and growth other than varieties of grass named in grass seed formula shall be removed. Removal may be accomplished by use of suitable herbicides or by physical removal, in which case top growth and roots shall both be removed, and bare spots exceeding specified limits shall be reseeded.
- E. If lawn or grass is established in the fall and maintenance is required to continue into spring months, lawn and grass shall receive an application of lime and fertilizer in the spring. Lime and fertilizer shall be spread in a uniform layer over the entire lawn surface, at the following rates.
- | <u>Material</u> | <u>Application Rate</u> |
|-----------------|-------------------------|
| Lime | 100 lb./1000 sq. ft. |
| Fertilizer | 20 lb./1000 sq. ft. |
- F. Remove rope barricades only after second cutting of lawns.

END OF SECTION

APPENDICES

Appendix A1: Roofing Limited Asbestos Survey Report – March 29, 2019
Appendix A2: Basement Asbestos Test Report – August 6, 2020
Appendix B: Existing Rooftop Equipment Report – July 31, 2020

MASS. STATE PROJECT NO. SSU-2021-A, Contract #1
ADMINISTRATION BUILDING ROOF & SIDEWALK REPLACEMENT
Salem State University, Salem, MA

Jones Architecture, Inc.
100% Construction Documents
July 31, 2020

Appendix A1: Roofing Limited Asbestos Survey Report – March 29, 2019

March 29, 2019

Mr. Ben Szalewicz
Assistant Vice President
Capital Planning and Facilities Management
352 Lafayette Street
Salem, Massachusetts 01970

RE: **Limited Asbestos Survey Report
Administrative Building – Roof and Sidewalk
352 Lafayette Street
Salem, Massachusetts
EFI Project No.: 020.00222**

Dear Mr. Szalewicz:

Pursuant to your request, EFI Global, Inc. (EFI) performed a limited asbestos survey at the Administrative Building located at 352 Lafayette Street in Salem, Massachusetts (Site). The limited asbestos survey was conducted on the roof and sidewalk.

SURVEY PROCEDURES

EFI asbestos inspector, Mr. Christopher Eustis (License No.: AI900600), conducted the site visit and asbestos testing on November 12, 2018 and March 28, 2019. Samples of suspect ACMs identified during the survey were collected and submitted under chain of custody protocol to EMSL Analytical, Inc. (EMSL) of Cinnaminson, New Jersey, a Massachusetts-licensed laboratory. EMSL is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos fiber analysis which is administered by the National Institute of Standards and Testing (NIST). The samples were analyzed using polarized light microscopy (PLM) with dispersion staining via EPA's "Method for the Determination of Asbestos in Bulk Building Materials" (EPA/600/R-93/116). Asbestos concentrations for the samples were determined by visual area estimation. Commonwealth of Massachusetts asbestos regulations define an ACM as any material containing greater than or equal to one percent asbestos.

SURVEY RESULTS

The following suspect ACMs sampled by EFI were reported by EMSL as containing no detectable concentration of asbestos:

- Black tar on sidewalk
- Black paper on crossover roof
- Black flashing on brick wall on crossover roof
- DensDeck on crossover roof
- Black window (seam) caulk on crossover roof
- White seam caulk on crossover roof
- Black paper on Administration roof
- DensDeck on Administration roof
- Black paper on Boiler Plant roof
- White window glazing on Boiler Plant roof
- Black window caulk on Boiler Plant roof
- Yellow mastic on brick wall on Boiler Plant roof
- Grey flashing caulk on Boiler Plant roof

- White fiberglass sealant

The following suspect ACMs sampled by EFI were reported by EMSL as containing greater than or equal to one percent asbestos, the Massachusetts limit for classification as ACM:

- Black flashing mastic on brick wall on Administration roof (approximately 50 square feet)
- Grey sealant on brick flashing on Connector roof (approximately 120 linear feet)
- Brown window glazing on Boiler Plant roof (approximately 100 linear feet)
- Black mastic on HVAC flashing on Boiler Plant roof (approximately 20 square feet)

There was no suspect asbestos-containing materials on the flashing of the HVAC units on the Connector or Administration roof.

A copy of the laboratory report prepared by EMSL is presented in Attachment A. A floor plan depicting the sample locations is presented in Attachment C.

CONCLUSIONS AND RECOMMENDATIONS

The black flashing mastic on the brick wall on the Administration roof, the grey sealant on the brick flashing on the Connector roof, the brown window glazing on the Boiler Plant roof, and the black mastic on HVAC flashing on the Boiler Plant roof were all reported by EMSL as ACMs. These materials were in good condition at the time of the survey.

EFI recommends that the area(s) of asbestos-containing materials present throughout the Project Area be removed and properly disposed by a Massachusetts licensed asbestos abatement contractor, in accordance with Massachusetts Department of Environmental Protection and Massachusetts Department of Labor Standards asbestos regulations. Third party air monitoring must be performed during and/or at the completion of abatement activities for re-occupancy of the Project Area by cleaning crews, construction trades, and residents. EFI is available to assist with abatement management, contractor oversight, and air monitoring as required by applicable Massachusetts and federal asbestos regulations.

If suspect ACMs other than the above-referenced materials are identified during renovation activities, EFI recommends that they be sampled by a Massachusetts-licensed asbestos inspector and analyzed by a Massachusetts-licensed asbestos analytical laboratory.

LIMITATIONS

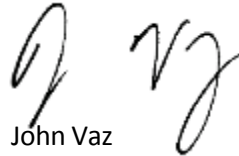
EFI's survey was limited to those portions of the Project Area accessible by reasonable and ordinary means. EFI did not perform destructive testing and investigations to identify suspect ACMs within the residence. EFI's inspection did not include an evaluation of underground foundation damp-proofing, transite water/sewer piping, and materials that may be present behind solid walls/ceilings and within mechanical and electrical equipment at the facility.

EFI is pleased to provide environmental consulting services to Salem State University. If you have any questions regarding the contents of this report, or are in need of additional information, please do not hesitate to contact either of the undersigned at 800-659-1202. Thank you for the opportunity to serve your environmental needs.

Sincerely,
EFI Global, Inc.



Christopher Eustis
Assistant Project Manager



John Vaz
Project Manager

Attachments:

- Attachment A - Photographs
- Attachment B – Laboratory Analytical Report
- Attachment C- Sample Location Plan

ATTACHMENT A

PHOTOGRAPHS



Photo 1: Black tar under sidewalk



Photo 2: Connector roof

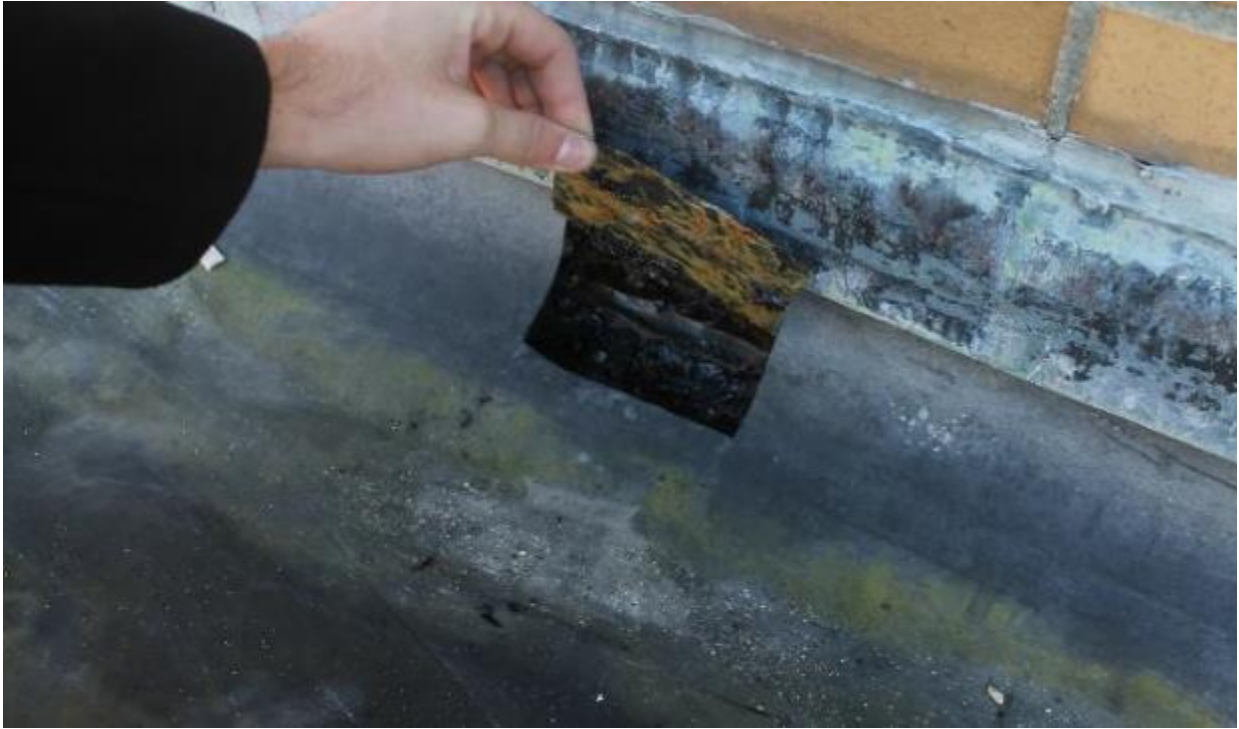


Photo 3: Grey sealant and black mastic on flashing of brick wall on Connector roof



Photo 4: Rubber membrane, Styrene, black paper and DenDeck on concrete Connector roof



Photo 5: Rubber membrane, Styrene, black paper, and DensDeck on concrete Administration roof



Photo 6: Black window caulk and grey seam caulk on connector roof



Photo 7: Black flashing mastic on brick wall on Administration roof



Photo 8: Rubber membrane, Styrene, and black paper on concrete Boiler Plant roof



Photo 9: Brown and white window caulk on Boiler Plant roof

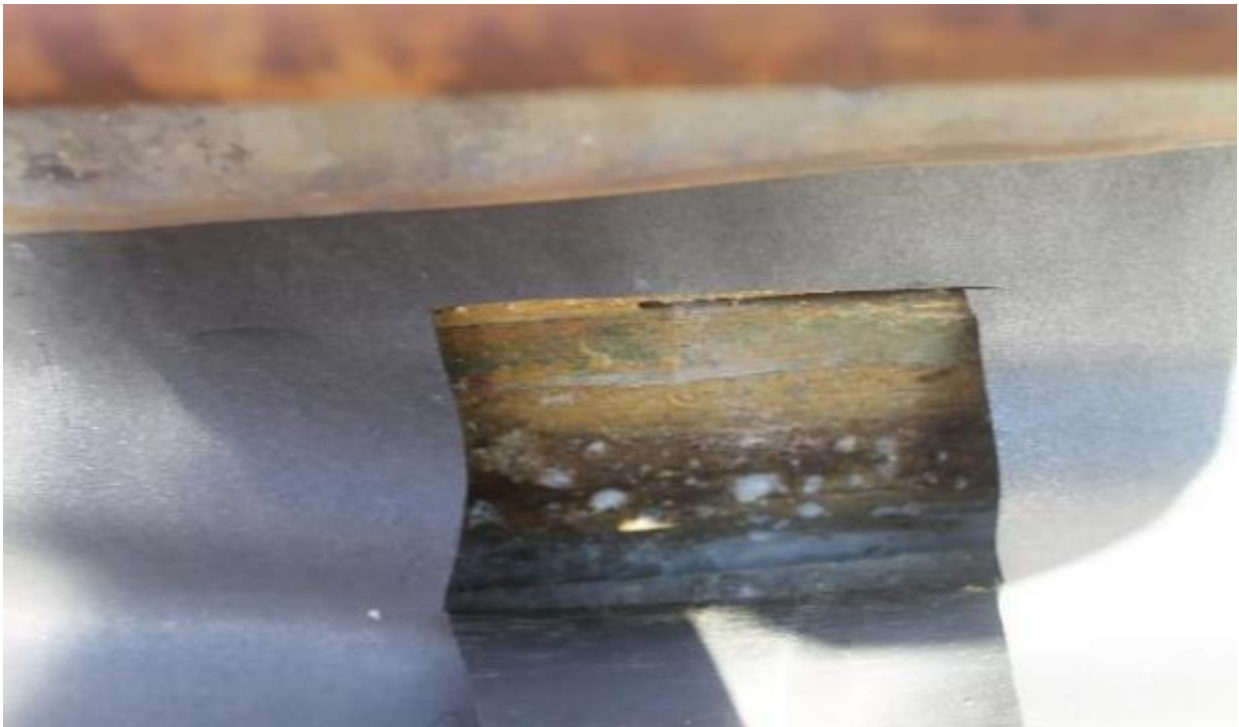


Photo 10: Yellow mastic on Boiler Plant brick flashing

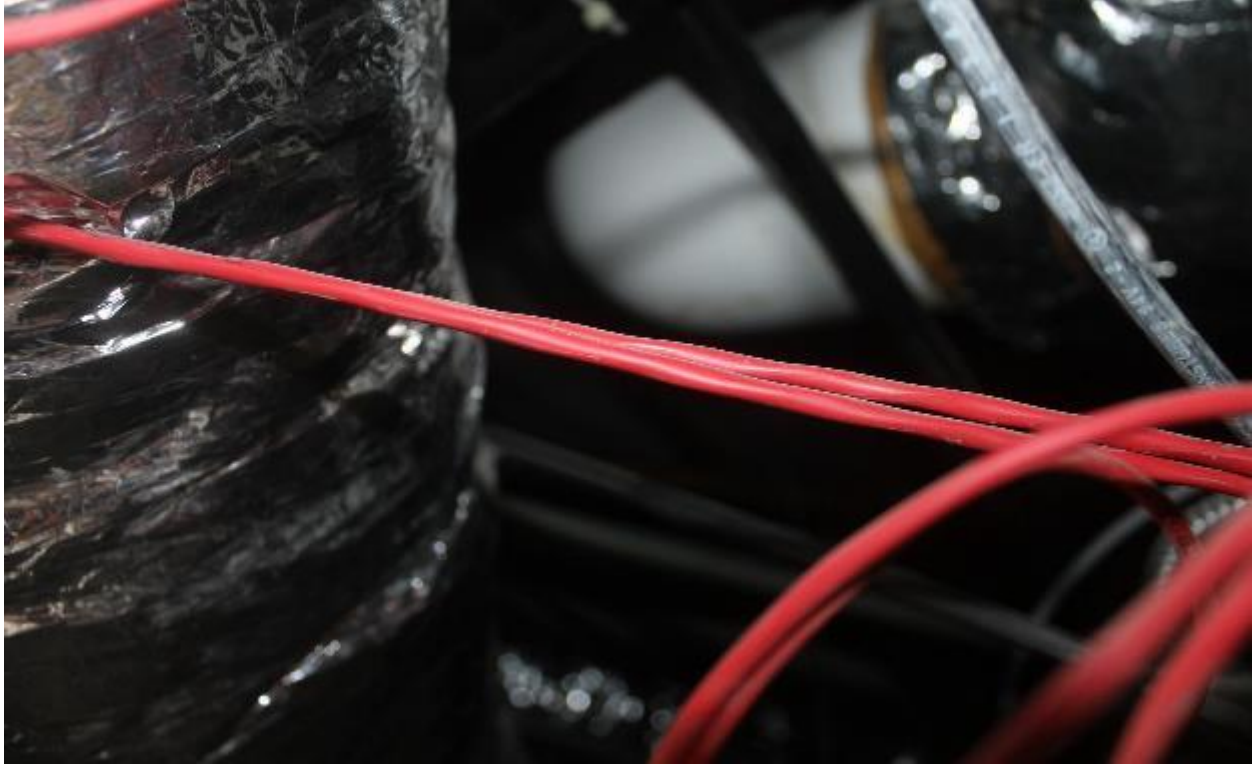


Photo 11: Fiberglass insulation on crossover roof drains



Photo 12: Fiberglass insulation on crossover roof drains



Photo 13: Boiler plant roof drain



Photo 14: Boiler plant roof drain



Photo 15: Fiberglass insulation on Administration building roof drains

ATTACHMENT B

LABORATORY ANALYTICAL REPORT



EMSL Analytical, Inc.

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com> / bostonlab@emsl.com

EMSL Order: 131902074

Customer ID: EAF166

Customer PO:

Project ID:

Attention: Chris Eustis
EFI Global, Inc.
155 West Street
Suite 6
Wilmington, MA 01887
Project: 020.00222 Salon State

Phone: (781) 801-7464

Fax: (978) 688-5494

Received Date: 03/28/2019 11:00 AM

Analysis Date: 03/28/2019

Collected Date: 03/28/2019

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
01A <small>131902074-0001</small>	Admin Bld - white fiber glass sealant	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
01B <small>131902074-0002</small>	Admin Bld - white fiber glass sealant	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s)

Elizabeth Stutts (2)

Steve Grise, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method"), but augmented with procedures outlined in the 1993 ("final") version of the method. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. All samples received in acceptable condition unless otherwise noted. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. EMSL recommends gravimetric reduction for all non-friable organically bound materials prior to analysis. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-139, VT AL998919, Maine Bulk Asbestos LB-0039

Initial report from: 03/28/2019 11:44:39



EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077

Tel/Fax: (800) 220-3675 / (856) 786-5974

<http://www.EMSL.com> / cinnaslab@EMSL.com

EMSL Order: 041833953

Customer ID: EAF166

Customer PO:

Project ID:

Attention: Chris Eustis
EFI Global, Inc.
155 West Street, Suite 6
Wilmington, MA 01887

Phone: (781) 801-7464

Fax: (978) 688-5494

Received Date: 11/13/2018 9:40 AM

Analysis Date: 11/15/2018 - 11/16/2018

Collected Date:

Project: Admin Bld. 020.00222

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
01A <small>041833953-0001</small>	Sidewalk - Black Tar	Black Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
01B <small>041833953-0002</small>	Sidewalk - Black Tar	Black Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (Other)	None Detected
02A <small>041833953-0003</small>	Crossover Roof - Black Paper	Black Fibrous Homogeneous	40% Cellulose 20% Glass	40% Non-fibrous (Other)	None Detected
02B <small>041833953-0004</small>	Crossover Roof - Black Paper	Black Fibrous Homogeneous	40% Cellulose 10% Glass	50% Non-fibrous (Other)	None Detected
03A <small>041833953-0005</small>	Crossover Roof	Brown Fibrous Homogeneous	6% Glass	94% Non-fibrous (Other)	None Detected
03B <small>041833953-0006</small>	Crossover Roof	Brown Fibrous Homogeneous	5% Glass	95% Non-fibrous (Other)	None Detected
04A <small>041833953-0007</small>	Crossover Roof - Black Flashing on Brick Wall	Black Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
04B <small>041833953-0008</small>	Crossover Roof - Black Flashing on Brick Wall	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
05A <small>041833953-0009</small>	Crossover Roof - Black Window Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
05B <small>041833953-0010</small>	Crossover Roof - Black Window Caulk	Black/Green Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
06A <small>041833953-0011</small>	Crossover Roof - White Seam Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
06B <small>041833953-0012</small>	Crossover Roof - White Seam Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
07A <small>041833953-0013</small>	Admin Roof - Black Paper	Black Fibrous Homogeneous	40% Cellulose 20% Glass	40% Non-fibrous (Other)	None Detected
07B <small>041833953-0014</small>	Admin Roof - Black Paper	Black/Yellow Fibrous Homogeneous	40% Cellulose 10% Glass	50% Non-fibrous (Other)	None Detected
08A <small>041833953-0015</small>	Admin Roof - Dens Deck	Brown Fibrous Homogeneous	6% Glass	94% Non-fibrous (Other)	None Detected
08B <small>041833953-0016</small>	Admin Roof - Dens Deck	Tan Fibrous Homogeneous	15% Cellulose 8% Glass	77% Non-fibrous (Other)	None Detected

Report amended: 11/26/2018 07:00:20 Replaces amended report from: 11/19/2018 15:52:20 Reason Code: Client-Change to Appearance



EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077

Tel/Fax: (800) 220-3675 / (856) 786-5974

<http://www.EMSL.com> / cinnasblab@EMSL.com

EMSL Order: 041833953
Customer ID: EAF166
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
09A <small>041833953-0017</small>	Admin Roof - Black Flashing on Brick	Black Non-Fibrous Homogeneous		92% Non-fibrous (Other)	8% Chrysotile
09B <small>041833953-0018</small>	Admin Roof - Black Flashing on Brick				Positive Stop (Not Analyzed)
10A <small>041833953-0019</small>	Connector Roof - Grey Sealant on Flashing	Gray Non-Fibrous Homogeneous		93% Non-fibrous (Other)	7% Chrysotile
10B <small>041833953-0020</small>	Connector Roof - Grey Sealant on Flashing				Positive Stop (Not Analyzed)
11A <small>041833953-0021</small>	Boiler Plant Roof - Black Paper	Black Fibrous Homogeneous	60% Cellulose 20% Glass	20% Non-fibrous (Other)	None Detected
11B <small>041833953-0022</small>	Boiler Plant Roof - Black Paper	Black Fibrous Homogeneous	60% Cellulose 20% Glass	20% Non-fibrous (Other)	None Detected
12A <small>041833953-0023</small>	Boiler Plant Roof - White Window Glazing	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
12B <small>041833953-0024</small>	Boiler Plant Roof - White Window Glazing	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
13A-Caulk <small>041833953-0025</small>	Boiler Plant Roof - Black Window Caulk	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
17A-Glazing <small>041833953-0025A</small>	Boiler Plant Roof - Window Glazing	Brown Non-Fibrous Homogeneous		95% Non-fibrous (Other)	5% Chrysotile
13B-Caulk <small>041833953-0026</small>	Boiler Plant Roof - Black Window Caulk	Gray/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
17B-Glazing <small>041833953-0026A</small>	Boiler Plant Roof - Window Glazing				Positive Stop (Not Analyzed)
14A <small>041833953-0027</small>	Boiler Plant Roof - Black HVAC Flashing	Black Fibrous Homogeneous	15% Cellulose	77% Non-fibrous (Other)	8% Chrysotile
14B <small>041833953-0028</small>	Boiler Plant Roof - Black HVAC Flashing				Positive Stop (Not Analyzed)
15A <small>041833953-0029</small>	Boiler Plant Roof - Yellow Flashing Mastic on Brick Wall	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
15B <small>041833953-0030</small>	Boiler Plant Roof - Yellow Flashing Mastic on Brick Wall	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
16A <small>041833953-0031</small>	Boiler Plant Roof - Gray Flashing Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
16B <small>041833953-0032</small>	Boiler Plant Roof - Gray Flashing Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Report amended: 11/26/2018 07:00:20 Replaces amended report from: 11/19/2018 15:52:20 Reason Code: Client-Change to Appearance



EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077

Tel/Fax: (800) 220-3675 / (856) 786-5974

<http://www.EMSL.com> / cinnasblab@EMSL.com

EMSL Order: 041833953

Customer ID: EAF166

Customer PO:

Project ID:

Analyst(s)

Chelsey Donnelly (6)

Jose Sanchez (16)

Samantha Rundstorm-Cruz (8)

Benjamin Ellis, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method"), but augmented with procedures outlined in the 1993 ("final") version of the method. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. All samples received in acceptable condition unless otherwise noted. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. EMSL recommends gravimetric reduction for all non-friable organically bound materials prior to analysis. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036, PA ID# 68-00367

Report amended: 11/26/2018 07:00:20 Replaces amended report from: 11/19/2018 15:52:20 Reason Code: Client-Change to Appearance

ATTACHMENT C

SAMPLE LOCATION PLAN

MASS. STATE PROJECT NO. SSU-2021-A, Contract #1
ADMINISTRATION BUILDING ROOF & SIDEWALK REPLACEMENT
Salem State University, Salem, MA

Jones Architecture, Inc.
100% Construction Documents
July 31, 2020

Appendix A2: Basement Asbestos Test Report – August 6, 2020

August 6, 2020

Mr. Gregory C. Burchard, AIA, LEED AP BD+C
Jones Architecture, Inc.
10 Derby Square, Suite 3
Salem, MA 01970

RE: **Asbestos Survey Report**
Administration Building, Salem State University
352 Lafayette Street, Salem, MA 01970
EFI Project No.: 020.01142

Dear Mr. Burchard:

Pursuant to your request, EFI Global, Inc. (EFI) performed a pre-renovation asbestos survey in the Administration Building of Salem State University located at 352 Lafayette Street in Salem, Massachusetts (Site). The purpose of the survey was to determine whether building materials that may be impacted during upcoming planned renovation activities contain asbestos. The site visit and asbestos survey were conducted on July 21, 2020 by Mr. John Vaz of EFI, a Massachusetts Department of Labor Standards (MassDLS) certified Asbestos Inspector (Certification No.: AI000270).

It is EFI's understanding that the planned renovations will impact the underground connecting tunnel, the adjoining corridor, the elevator lobby and machine room, and a portion of the boiler room associated with the building (Project Area). EFI's survey was limited to these areas and did not include the entire building. Please note that the boiler room area that was assessed for this project was limited to the 10 feet from the shared corridor/boiler room wall, per client request.

SURVEY PROCEDURES

An asbestos survey was performed prior to the start of planned renovations in accordance with 40 CFR Part 61 Subpart M and 310 CMR 7.15. Samples of suspect ACMs identified during the survey were collected and submitted under chain of custody protocol to EMSL Analytical, Inc. (EMSL) of Woburn, Massachusetts, a Massachusetts-licensed laboratory. EMSL is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos fiber analysis which is administered by the National Institute of Standards and Testing (NIST). The samples were analyzed using polarized light microscopy (PLM) with dispersion staining via EPA's "Method for the Determination of Asbestos in Bulk Building Materials" (EPA/600/R-93/116). Asbestos concentrations for the samples were determined by visual area estimation. Commonwealth of Massachusetts Department of Environmental Protection (MassDEP) asbestos regulations define an ACM as a material containing greater than or equal to one percent asbestos.

Destructive sampling methods were performed using hand tools to inspect areas with difficult access including below flooring materials to the concrete deck.

SURVEY RESULTS

The following suspect ACMs sampled by EFI were reported by EMSL as containing greater than or equal to one percent asbestos, the Massachusetts limit for classification as ACM:

- Pipe Insulation located in boiler room and adjoining corridor (approximately 305 linear feet)

At the time of EFI's survey, the pipe insulation appeared in good condition; however, water staining was observed on piping at the ceiling of the boiler room. No debris was observed on the floor below, and the pipe insulation appeared intact.

The following suspect ACMs sampled by EFI were reported by EMSL as containing no detectable concentration of asbestos:

- Skim on concrete wall
- 2' x 4' crow feet ceiling tile
- Gypsum wallboard
- Joint compound
- White cove base and associated brown adhesive
- Black cove base and associated yellow adhesive
- 12" x 12" black with red speck floor tile and associated Yellow mastic
- Skim on concrete wall/ceiling
- Brown cove base and associated yellow adhesive
- Grey epoxy paint on floor

A copy of the laboratory report prepared by EMSL and photographs of the building materials sampled by EFI are attached.

CONCLUSIONS AND RECOMMENDATIONS

EFI recommends that the damaged area(s) of asbestos-containing pipe insulation present in the boiler room and adjoining corridor be removed and properly disposed by a Massachusetts licensed Asbestos Contractor, in accordance with Massachusetts Department of Environmental Protection and Massachusetts Department of Labor Standards asbestos regulations. Third party air monitoring must be performed during and/or at the completion of abatement activities for re-occupancy of the Project Area by cleaning crews, construction trades, and occupants. EFI is available to assist with abatement management, contractor oversight, and air monitoring as required by applicable Massachusetts and federal asbestos regulations.

If suspect ACMs other than the above-referenced materials are identified during renovation activities, EFI recommends that they be sampled by a MassDLS-certified asbestos inspector and analyzed by a Massachusetts-licensed asbestos analytical laboratory.

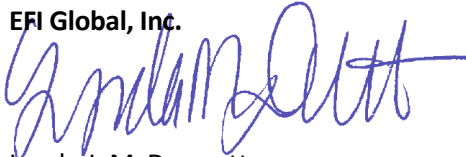
LIMITATIONS

EFI's survey was limited to the underground connecting tunnel and immediately surrounding rooms (boiler room, adjoining corridor, elevator lobby and machine room) by reasonable and ordinary means. EFI did not perform destructive testing and investigation to identify suspect ACMs within the Project Area

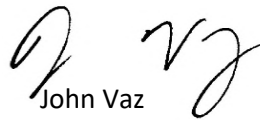
that may be concealed by behind solid walls/ceilings and within mechanical and electrical equipment. Our survey did not include the roof and other exterior building areas or underground areas that may contain foundation damp-proofing, transite water/sewer piping, or other suspect materials.

EFI is pleased to provide environmental consulting services to Jones Architecture. If you have any questions regarding the contents of this report, or are in need of additional information, please do not hesitate to contact either of the undersigned at 800-659-1202. Thank you for the opportunity to serve your environmental needs.

Sincerely,
EFI Global, Inc.



Lynda J. McDermott
Project Manager



John Vaz
Senior Project Manager

Attachment: Photographs
 Laboratory Analytical Report and Chain of Custody
 Sample Location Drawing
 Asbestos Location Drawing

PHOTOGRAPHS



Main Corridor. Note skim on wall, grey epoxy wall/ceiling, and brown cove base/ adhesive



Boiler Room. Note 2'x4' crow feet ceiling tile and ACM pipe insulation



ACM pipe insulation in Adjoining Corridor



Black with red speck floor tile/mastic, black and white cove base and mastic in Adjoining Corridor



Elevator machine room



Gypsum wallboard and associated joint compound in the Main Corridor

**LABORATORY ANALYTICAL REPORT
AND CHAIN OF CUSTODY**



EMSL Analytical, Inc.

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com/bostonlab@emsl.com>

EMSL Order: 132004838

Customer ID: EAF166

Customer PO:

Project ID:

Attention: John Vaz
EFI Global, Inc.
155 West Street
Suite 6
Wilmington, MA 01887

Phone: (978) 688-3736

Fax: (978) 688-5494

Received Date: 07/21/2020 10:30 AM

Analysis Date: 07/24/2020

Collected Date:

Project: 020.01142; Salem State University - Southern Hall Basement

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
001A <small>132004838-0001</small>	Boiler Room - Skim on Concrete Wall	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
001B <small>132004838-0002</small>	Boiler Room - Skim on Concrete Wall	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
001C <small>132004838-0003</small>	Boiler Room - Skim on Concrete Wall	Gray/Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
002A <small>132004838-0004</small>	Boiler Room - Pipe Insulation	White Fibrous Homogeneous		83% Non-fibrous (Other)	10% Amosite 7% Chrysotile
002B <small>132004838-0005</small>	Boiler Room - Pipe Insulation				Positive Stop (Not Analyzed)
003A <small>132004838-0006</small>	Boiler Room - 2x4 Crow Feet Ceiling Tile	Gray/White Fibrous Homogeneous	30% Cellulose 50% Min. Wool	20% Non-fibrous (Other)	None Detected
002C <small>132004838-0007</small>	Corridor - Pipe Insulation				Positive Stop (Not Analyzed)
004A <small>132004838-0008</small>	Corridor - Gypsum Wallboard	Tan/White Fibrous Homogeneous	10% Cellulose 2% Glass	88% Non-fibrous (Other)	None Detected
005A <small>132004838-0009</small>	Corridor - White Cove Base	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
006A <small>132004838-0010</small>	Corridor - Assoc. Brown Adhesive	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
007A <small>132004838-0011</small>	Corridor - Black Cove Base	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
007B <small>132004838-0012</small>	Corridor - Black Cove Base	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
008A <small>132004838-0013</small>	Corridor - Assoc. Yellow Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
008B <small>132004838-0014</small>	Corridor - Assoc. Yellow Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
003B <small>132004838-0015</small>	Corridor - 2x4 Crow Feet Ceiling Tile	Gray/White Fibrous Homogeneous	50% Cellulose 30% Min. Wool	20% Non-fibrous (Other)	None Detected
009A <small>132004838-0016</small>	Corridor - 12x12 Black w/Red Speck Floor Tile	Red/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 07/24/2020 11:14:22



EMSL Analytical, Inc.

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com/bostonlab@emsl.com>

EMSL Order: 132004838
Customer ID: EAF166
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
009B <small>132004838-0017</small>	Corridor - 12x12 Black w/Red Speck Floor Tile	Red/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
010A <small>132004838-0018</small>	Corridor - Assoc. Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
010B <small>132004838-0019</small>	Corridor - Assoc. Yellow Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
005B <small>132004838-0020</small>	Main Hallway - White Cove Base	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
006B <small>132004838-0021</small>	Main Hallway - Assoc. Brown Adhesive	Brown/Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
001D <small>132004838-0022</small>	Main Hallway - Skim on Concrete Wall/Ceiling	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
001E <small>132004838-0023</small>	Main Hallway - Skim on Concrete Wall/Ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
001F <small>132004838-0024</small>	Main Hallway - Skim on Concrete Wall/Ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
001G <small>132004838-0025</small>	Main Hallway - Skim on Concrete Wall/Ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
004B <small>132004838-0026</small>	Main Hallway - Gypsum Wallboard	Gray/Tan Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
004C <small>132004838-0027</small>	Main Hallway - Gypsum Wallboard	White Fibrous Homogeneous	2% Cellulose 2% Glass	96% Non-fibrous (Other)	None Detected
011A <small>132004838-0028</small>	Main Hallway - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
011B <small>132004838-0029</small>	Main Hallway - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
011C <small>132004838-0030</small>	Main Hallway - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
012A <small>132004838-0031</small>	Main Hallway - Brown Cove Base	Brown/Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
012B <small>132004838-0032</small>	Main Hallway - Brown Cove Base	Brown/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
013A <small>132004838-0033</small>	Main Hallway - Assoc. Yellow Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
013B <small>132004838-0034</small>	Main Hallway - Assoc. Yellow Adhesive	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
014A <small>132004838-0035</small>	Main Hallway - Grey Epoxy Paint on Floor	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 07/24/2020 11:14:22



EMSL Analytical, Inc.

5 Constitution Way, Unit A Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

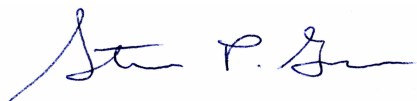
<http://www.EMSL.com> / bostonlab@emsl.com

EMSL Order: 132004838
Customer ID: EAF166
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
014B <small>132004838-0036</small>	Main Hallway - Grey Epoxy Paint on Floor	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
014C <small>132004838-0037</small>	Main Hallway - Grey Epoxy Paint on Floor	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s) _____
 Elizabeth Stutts (35)



 Steve Grise, Laboratory Manager
 or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method"), but augmented with procedures outlined in the 1993 ("final") version of the method. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. All samples received in acceptable condition unless otherwise noted. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. EMSL recommends gravimetric reduction for all non-friable organically bound materials prior to analysis. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-139, VT AL998919, Maine Bulk Asbestos LB-0039

Initial report from: 07/24/2020 11:14:22

132004838



BOSTON NORTH

BULK SAMPLE CHAIN OF CUSTODY FORM

Report to (Your Name):	John Vaz	Bill To:	Accounts Payable
Company:	EFI Global, Inc.	Address:	Same
Address:	155 West Street Suite 6	City, State, Zip:	Same
City, State, Zip:	Wilmington, MA 01887	Telephone:	800-659-1202
		Fax:	978-688-5494
Project Information			
Project No. and Description:	020.01142 - Salem State University - Sullivan Hall Basement		
Email Report to:	Lynda.McDermott@efiglobal.com; Sean.McLay@efiglobal.com; Jessica.Rauseo@efiglobal.com		
Alternate (Your Email):	John.Vaz		
Requested Turnaround Time			
<input type="checkbox"/> 3 hour	<input type="checkbox"/> 6 hour	<input type="checkbox"/> 1 day (24hr)	<input type="checkbox"/> 2 day (48hr)
		<input checked="" type="checkbox"/> 3 day (72 hr)	<input type="checkbox"/> 4 day (96 hr)
			<input type="checkbox"/> 1 week
			<input type="checkbox"/> 2
Media and Methodology			
Type of Analysis:	PLM Asbestos	Check for Positive Stop:	<input checked="" type="checkbox"/>
Notes:	Please analyze all plaster and joint compound samples.		

Sample ID	Type of Material	Location
001A,B,C	Skim on Concrete wall	Boiler Room
002A,B	Pipe Insulation	" "
003A	2x4 Crow Feet Ceiling Tile	" Room
002C	Pipe Insulation	Corridor
004A	Cupson Wallboard	"
005A	White Cove Base	"
006A	Assoc Brown Adhesive	"
007A,B	Black Cove Base	"
008A,B	Assoc. Yellow Adhesive	"
003B	2x4 Crow Feet Ceiling Tile	"
009A,B	12x12 Black w/Red Spot Floor Tile	"

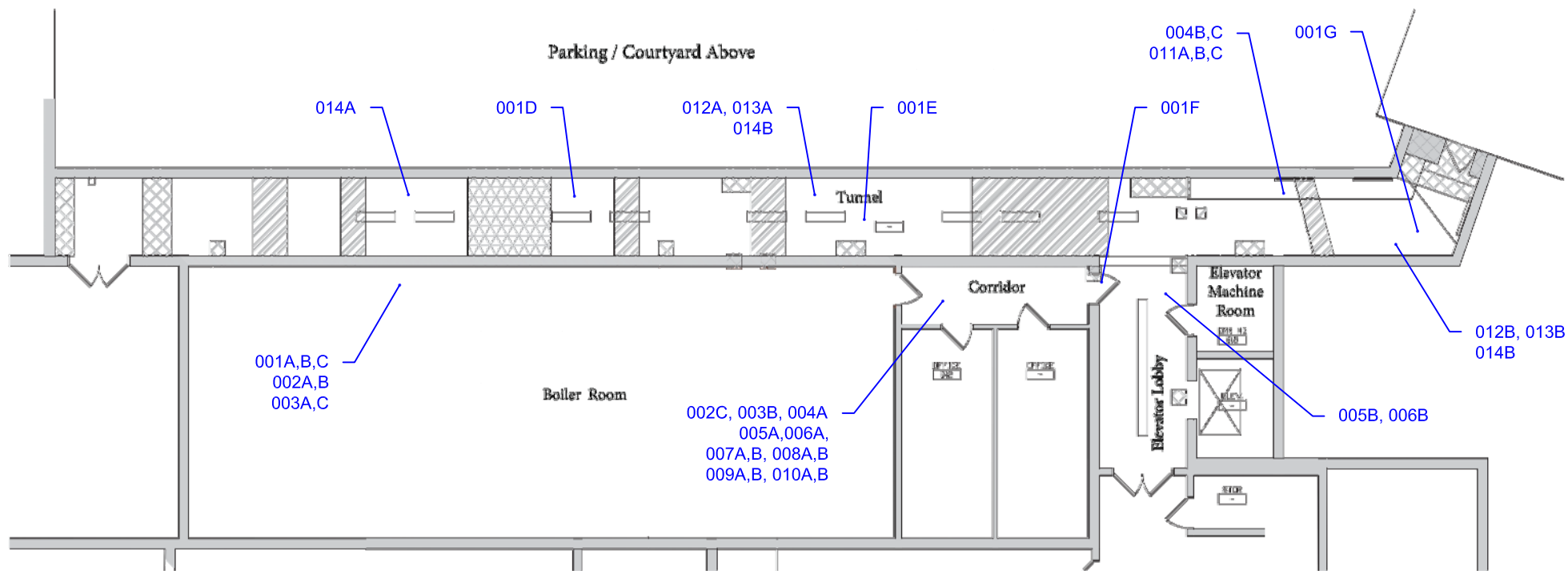
Total Number of Samples Submitted: _____ Date Collected: 7/21/2020

Samplers Name: John Vaz Samplers Signature:

Relinquished By (EFI): Date: 7/21/2020 Time: _____

Received By (Lab): _____ Date: _____ Time: _____

SAMPLE LOCATION DRAWING



PLEASE NOTE: DRAWING NOT TO SCALE.

LEGEND:

XXX = ASBESTOS BULK SAMPLE LOCATIONS

SAMPLE LOCATION DRAWING

BASEMENT

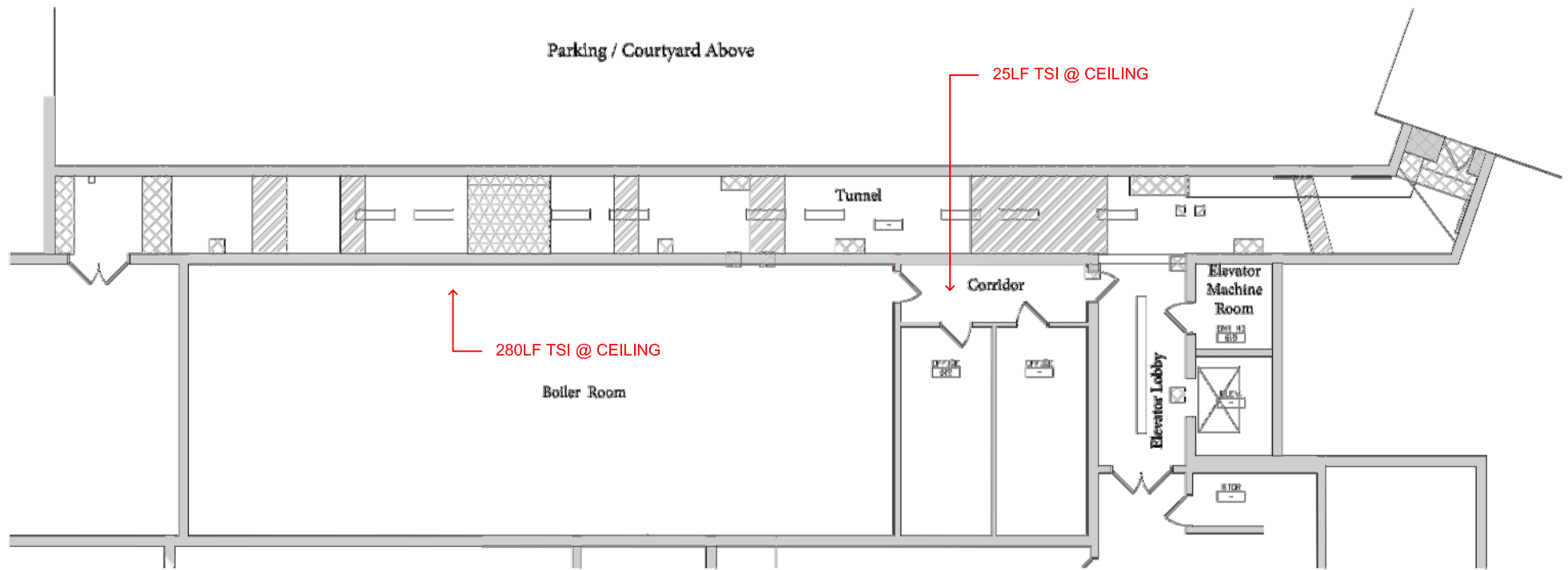
SULLIVAN HALL, ADMINISTRATION BUILDING
 SALEM STATE UNIVERSITY
 352 LAFAYETTE STREET, SALEM, MA
 EFI PROJECT NO.: 020.01142



FIGURE

1

ASBESTOS LOCATION DRAWING



PLEASE NOTE: DRAWING NOT TO SCALE.

LEGEND:

XXX = ASBESTOS-CONTAINING TSI AT CEILING

ACM LOCATION DRAWING

BASEMENT

SULLIVAN HALL, ADMINISTRATION BUILDING
 SALEM STATE UNIVERSITY
 352 LAFAYETTE STREET, SALEM, MA
 EFI PROJECT NO.: 020.01142



FIGURE

2

MASS. STATE PROJECT NO. SSU-2021-A, Contract #1
ADMINISTRATION BUILDING ROOF & SIDEWALK REPLACEMENT
Salem State University, Salem, MA

Jones Architecture, Inc.
100% Construction Documents
July 31, 2020

Appendix B: Existing Rooftop Equipment Report – July 31, 2020

Salem State University

**Administration Building,
Dining Commons, and Boiler
Plant Roof Replacement**

Salem, MA

Existing Conditions Report

for
Jones Architecture
10 Derby Square
Salem, MA 01970

RFS 20-9335.001

July 31, 2020





Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement Study

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Attachment

Existing Mechanical Equipment on Admin Roof

Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

A. INTRODUCTION

RFS reviewed the current HVAC equipment conditions on the roof of the Administration Building, Dining Commons, and Boiler Plant at Salem State University. As part of the review, we were tasked with recommending the steps necessary to accommodate roofing work. Although no existing HVAC plans were available to thoroughly study the use of the equipment on the roof, below are the general recommendations, based on the observation, RFS recommends the following actions. In addition to the comments below, please refer to mechanical floor plans and the following images below with corresponding location number. The numbers indicated in this document correspond to the numbers on satellite images of the roof where with the images for all mechanical equipment are identified.

B. MECHANICAL SYSTEMS

Contractor to verify the use and operation of equipment prior to removal and provide with temporary alternatives for the course of construction where needed.

Install all mechanical equipment including Packaged air handling units, Fans, air cooled condensers and unit ventilators with 24" tall insulated roof curbs. Flash roof curbs for watertight installation. Roof curb extensions with necessary duct modifications may be used to achieve new roof curb height. Currently equipment roof curb heights vary quite a bit and with new increase roof insulation, curbs will require replacement.

Install air cooled condensing units with 24" factory or field fabricated support stand. Currently, majority of the units are placed on wood or directly on the roof. All roof curbs shall extend 24" above finished roof. Mechanical contractor shall refer to architectural documents for roof insulation thickness and finished roof elevations.

1. EQUIPMENT LIST

a. Existing Packaged Air Handling Unit (Location #1)



- USE: Unknown

Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

b. Existing Packaged Air Handling Unit (Location #2)



- USE: Not used
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

c. Existing Exhaust Fan (Location #3)



- USE: Unknown
- CONDITION: Fair

Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

- AGE: Unknown/old
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

d. Existing Packaged Air Handling Unit (Location #4)



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

e. Existing Exhaust Fan (Location #5)



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

f. Existing Packaged Air Handling Unit (Location #6)



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

g. Existing (small) Refrigeration Condensing unit (Location #7)



- USE: Abandoned in place.

Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

- CONDITION: Poor
- AGE: Unknown/Old
- RECOMMENDATIONS: Remove and discard.

h. Existing Packaged Air Handling Unit (Location #8)



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

i. Existing two (2) Air Cooled Condensing Units (Location #9)



Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

j. Existing Air cooled Condensers (Location #10)



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

k. Existing Exhaust Fans (Location #11)



Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

- USE: Unknown
- CONDITION: Fair
- AGE: Unknown/Old
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

l. Existing Three (3) Gravity Ventilators (Location #12)



- USE: Unknown
- CONDITION: Poor (Rusting)
- AGE: Old
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

m. Existing Boiler Flue (Location #13)



Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

- USE: Unknown
- CONDITION: Good/Fair
- AGE: Unknown
- RECOMMENDATIONS: Provide new flashing as required.

n. Existing Vent (Location #14)



- USE: Unknown
- CONDITION: Bad
- AGE: Unknown
- RECOMMENDATIONS: Replace with new in kind and reinstall with proper roof flashing.

o. Existing Carrier Packaged Air Handling Unit (Location #15)



- USE: Unknown
- CONDITION: Fair

Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

- AGE: Unknown
- RECOMMENDATIONS: Disconnect and temporarily remove services external to the unit for roofing work. Reinstall all services as necessary. Provide flashing to the existing roof curb as required per architectural detail.

p. Existing Carrier Packaged Air Handling Unit (Location #16)



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Disconnect and temporarily remove services external to the unit for roofing work. Reinstall all services as necessary. Provide flashing to the existing roof curb as required per architectural detail.

q. Existing Carrier Packaged Air Handling Unit (Location #17)



Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Disconnect and temporarily remove services external to the unit for roofing work. Reinstall all services as necessary. Provide flashing to the existing roof curb as required per architectural detail.

r. **Existing Exhaust Fan (Location #18)**



- USE: Unknown
- CONDITION: Old
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

s. **Existing Gravity Ventilator, Capped Roof Curb and two (2) Exhaust Fans (Location #19)**



Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

t. Existing Packaged Air Handling Unit (Location #20)



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

u. **Existing Greenheck Packaged Air Handling Unit (Location #21)**



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

v. **Existing Kitchen Exhaust Fan (Location #22)**



- USE: Unknown
- CONDITION: Poor
- AGE: Unknown/Old
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

w. **Existing Two (2) Active Kitchen Exhaust Fans and One (1) Abandoned Exhaust Fan (Location #23)**



- USE: Unknown
- CONDITION: Poor
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb. Discard abandoned fan.

x. **Existing Kitchen Exhaust Fan (Location #24)**



- USE: Unknown
- CONDITION: Poor
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

y. Existing three (3) Exhaust Fans (Location #25)



- USE: Unknown
- CONDITION: Poor
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

z. Existing three (3) Refrigeration Condensing Units (Location #26)



Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

- USE: Unknown
- CONDITION: One Unit is Poor, Two Other Units Are Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

aa. Existing Gravity Ventilator (Location #27)



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

bb. Existing Daikin Packaged Air Handling Unit (Location #28)



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

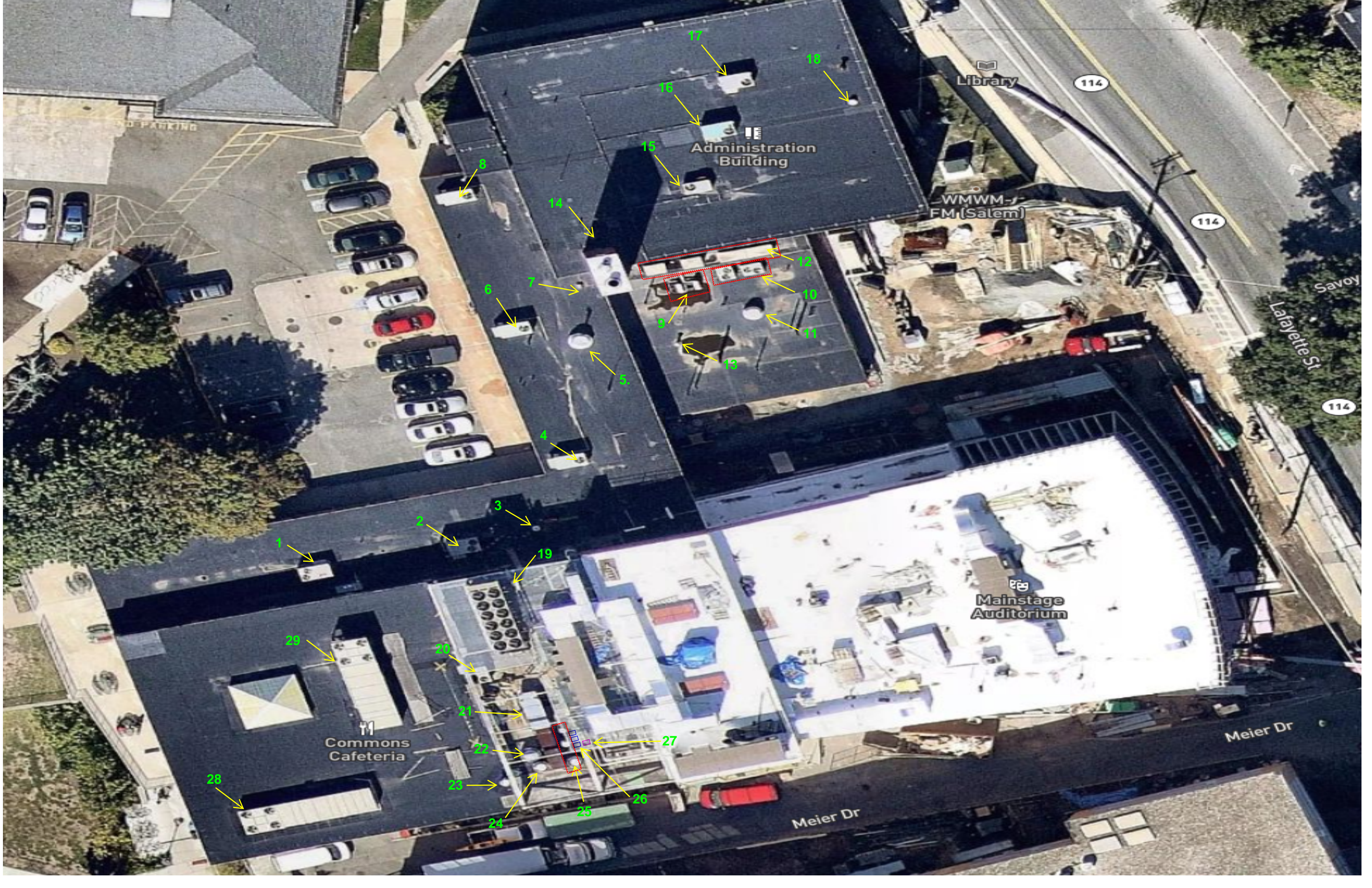
Salem State University Administration Building, Dining Commons, and Boiler Plant Roof Replacement - Existing Conditions Report

cc. **Existing Daikin Packaged Air Handling Unit (Location #29)**



- USE: Unknown
- CONDITION: Fair
- AGE: Unknown
- RECOMMENDATIONS: Remove and reinstall with new 24" roof curb.

Attachment



Library

114

Administration Building

WMWM-FM (Salem)

114

Savoy

Lafayette St

114

Mainstage Auditorium

Commons Cafeteria

Meier Dr

Meier Dr

Mechanical

Electrical

Plumbing

Fire Protection

Civil

Structural

Technology

Lighting

Sustainability

Commissioning



Rist-Frost-Shumway Engineering, P.C.

**71 Water Street
Laconia, NH 03246
603.524.4647**

**50 Milk Street, 16th Floor
Boston, MA 02109
617.494.1464**

**82 Hanover Street, Suite 2
Portland, ME 04101
207.761.4647**

