The Commonwealth of Massachusetts

University of Massachusetts
Amherst

Contract For

Mullins Center and Garber Field Videoboards

Special Attention to Bidders

⇒ Bids must be made on the enclosed form.
⇒ Fill in all applicable blank spaces on all pages of this form.
⇒ Return complete form intact.
Bid Express

All construction projects at the University of Massachusetts Amherst are available for bidding on the Bid Express website at: bidexpress.com. Submitting bids via the Bid Express website will become mandatory for any bid advertised on or after July 1, 2015.

Electronic bids may be submitted at the bidexpress.com website. All electronic bidders must first register on bidexpress.com and create an Info Tech Digital ID. Registration and Digital ID creation are free. It can take up to five business days to process your Digital ID and it is highly recommended that a Digital ID be enabled at least 48 hours in advance of submitting an electronic bid. Please plan accordingly. A fee of $25 will be incurred for bidding electronically on a pay-per solicitation basis; alternatively, you may subscribe for $50 per month to have access to all solicitations and email notifications.

Electronic Bid Bonds: To utilize the Electronic Bid Bond option, please contact either Surety 2000 at 800-660-3263 or help@surety2000.com or InSure Vision Technologies at 818-783-3460 or info@insurevision.com

For additional guidance, please contact the Bid Express team at toll free (888) 352-2439 (select option 1) or at support@bidexpress.com

Traditional Paper Bid Bonds or Certified Check: If you choose not to utilize the Electronic Bond Option you may upload a scanned copy of your Bond or Certified Check when submitting your bid, the scanned copies must be followed up with a hard copy delivered to the Procurement Office, Mass Venture Way, Room 334, Hadley, MA 01035 within 72 hours after the bid opening. Failure to submit a hard copy of your bid bond or certified check within the specified time period will result in the rejection of your bid.

Note that failure to submit a hard copy of your bid bond or certified check more than two times in a twelve month period will result in a twelve month ban on submitting bids to the University.

During the introductory period only one copy of your bid should be submitted either through Bid Express or a hard copy delivered to Procurement; in the event that a company submits a bid both on Bid Express and a hard copy to Procurement then the Bid Express bid will be considered the official bid and the hard copy will not be considered
Attention Contractors
(Effective July 1, 2013)

UMASS Amherst is a Tobacco-Free campus

Starting July 1, 2013, the University of Massachusetts will prohibit tobacco use everywhere on campus, inside buildings and throughout the grounds. The policy applies to everyone and anyone on campus, inside buildings and throughout the grounds. This policy applies to everyone and anyone, including students, staff, faculty, contractors and visitors. For the purpose of this policy, “tobacco” refers to any and all tobacco products, whether inhaled or ingested, as well as electronic cigarettes.

1. The use of tobacco will be prohibited in all buildings and vehicles owned or leased by UMASS Amherst, regardless of location.

2. The use of tobacco will also be prohibited on all University grounds and in any outdoor area controlled by the University. This includes all University land, parking lots and parking ramps, athletic fields, tennis courts and recreational areas.

3. The use of tobacco will be prohibited inside any vehicle located on University grounds.

4. When any person enters the grounds of the University, any smoking material shall be extinguished and disposed of in an appropriate receptacle at the perimeter of the grounds of the University.
Attention Contractors  
(Effective July 1\textsuperscript{st}, 2012)

The University of Massachusetts Amherst will be posting \textbf{all addenda} to the procurement website:

\url{http://www.umass.edu/procurement/constructionprojects.htm}

Effective July 1st 2012 the university will \textbf{not} be sending out hard copies of the addenda. Notification will be sent via e-mail to all plan holders of record once an addendum has been posted to the website.

***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.***
ATTENTION CONTRACTORS & SUBCONTRACTORS
(EFFECTIVE AUGUST 1, 2006)

ALL CONTRACTORS AND SUBCONTRACTORS PLEASE NOTE THE NEW UNIVERSITY OF MASSACHUSETTS AMHERST 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 AND CERTIFICATE OF COMPLIANCE WITH EMPLOYMENT ELIGIBILITY VERIFICATION REQUIREMENTS, AND 2) MUST CERTIFY IN EACH CERTIFIED PAYROLL REPORT SUBMITTED TO UNIVERSITY OF MASSACHUSETTS AMHERST, 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)

M.G.L. c. 30, § 39S (a)(2) 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.
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UNIVERSITY OF MASSACHUSETTS AMHERST

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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 (UMA Form 5)
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BID PACKAGE

PART I

INSTRUCTIONS TO BIDDERS

Instructions to Bidders

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Attachment B: Forms Used During Bidding

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Sample Sub-bidder Certificate of Eligibility

Update Statement – Prime Bidder

Sub-bidder Update Statement

Form for General Bid

Form for Sub-Bid
UNIVERSITY OF MASSACHUSETTS AMHERST

INSTRUCTIONS TO BIDDERS

Awarding Authority:
University of Massachusetts Amherst
Procurement Office, Mass venture Center
100 Venture Way, Room 334
Hadley, MA 01035

Telephone: 413/545-0361

UMA No. 17-06
Project No. 1008489
Title: Mullins Center and Garber Field, Videoboards

Category of Work: General Building Construction

Project Description and Scope:
HVAC & Electrical Work
Note: Completion date based upon executed contract date is: June 23, 2017

Pre-Bid Meeting Information (if any):
November 2, 2016 at 10:00 a.m. at Mullins Center, North West Entry, 200 Commonwealth Avenue, Amherst, MA 01003-9248

Deadline for filing filed Sub-bids is 12:00 noon on November 15, 2016.
Deadline for filing General bids is 2:00 p.m. on November 22, 2016.
The list of filed subtrades for this project is found at Page 10 of these Instructions to Bidders.

The minimum wage rate requirements for this Contract are 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 worksite 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 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 combined participation goal for Minority/Women Business Enterprise for this Contract is 2.7%.

The MBE/WBE participation goal must include a reasonable representation of both MBE and WBE firms that meet or exceeds the combined goal. MBE/WBE participation plans that consist solely of either a MBE or WBE representing 100% of the overall combined goals will not be considered reasonable or responsive. Firms submitting MBE/WBE participation plans which do not provide reasonable participation by both MBE/WBE firms shall be provided an opportunity to revise and resubmit their plans within the time frame set by the awarding authority; however, no price adjustments shall be permitted as a result of the revised plan. Firms failing to submit an MBE/WBE participation plan deemed reasonable, and accepted by the awarding authority, shall not be awarded the contract.

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 University of Massachusetts Amherst, Procurement Office, Mass Venture Center, 100 Venture Way, Room 334, Hadley, MA 01035, and copies may be obtained by depositing a company, treasurer's, cashier's, or bank check, in the sum of $150.00 per set payable to the University of Massachusetts. A refund will be made to those returning the documents in satisfactory condition within 10 working days after the general bid opening. Otherwise this deposit shall become the property of the University.

CLOSING: Should the University of Massachusetts Amherst close the campus for any reason on the scheduled day of the bid opening, the bid opening date will be extended to the next normal business day for the University at the same time/same place. It is the bidder's responsibility to verify by going to the University closing website at: www.umass.edu/closing or by public announcements.
The filed sub-trades for this project are as follows:

<table>
<thead>
<tr>
<th>Section #</th>
<th>Filed Sub-trade</th>
<th>All Bid Deposits</th>
</tr>
</thead>
<tbody>
<tr>
<td>230001</td>
<td>HVAC</td>
<td></td>
</tr>
<tr>
<td>260001</td>
<td>electrical Work</td>
<td></td>
</tr>
</tbody>
</table>

(Sub-bid forms pages 60-64)

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 the site and examined 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 University of Massachusetts 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 current Certificate of Eligibility issued by the Division of Capital Asset Management and Maintenance ("DCAM"), DCAM Form CQ 7, showing that the Bidder has been approved to bid on projects of 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 current Contractor Update Statement, DCAM Form CQ3.

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 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 current 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 current 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 five (5) calendar days, excluding weekend and holidays, unless otherwise specified, before the date set for the receipt of general Bids, or, if a question pertains to Item 2 filed sub-Bid work, at least five (5) calendar days, excluding weekend and holidays, unless otherwise specified, before the date set for the receipt of filed sub-Bids. The Awarding Authority will post any addenda or written interpretations that it deems necessary on the Procurement website: http://www.umass.edu/procurement/constructionprojects.htm. 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, as posted on the website. 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 the 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 subcontractors 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 subcontractors' bond premiums shall be paid for by the general Contractor 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 sub-trade listed under Item 2, general Bidders shall list the sub-trade 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 sub-trade 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 sub-trade and the actual subcontract amount.

5.11 Overhead and profit for supervision of the sub-trade 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 sub-trade 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 subcontractor must be accompanied by a bid deposit in the form of a bid bond; a check certified by, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to the University of Massachusetts Amherst. 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, Sub-Bidder Certificate of Eligibility and properly completed Sub-Bidder Update Statement shall be enclosed in a sealed envelope with the following plainly marked on the outside:

Filed Sub-Bid for:

UMA No. ______________________
Project No. _____________________
Title: __________________________
Sub-Bid Section No. ______________
Trade: __________________________
Sub-Bidders name, business address, and telephone number:

6.2 Each general Bid, including the bid deposit, DCAM Certificate of Eligibility (CQ7), and properly completed Update Statement (CQ3), shall be enclosed in a sealed envelope with the following plainly marked on the outside:

General Bid for:
UMA No. ______________________
Project No. _____________________
Title: __________________________
General Bidders name, business address, and telephone number.

6.3 All Bids must be received by the Procurement Department at the address specified on page 8 of these Instructions to Bidders no later than the applicable date and time specified on page 8 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 University of Massachusetts Amherst, Attn: Director of Procurement, Procurement Office, Mass Venture Center, 100 Venture Way, Room 334, Hadley, MA 01035 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 AND 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 MBE and WBE participation goals for this Contract are as set forth on the first page of these Instructions to Bidders. The Awarding Authority reserves the right to reduce or waive the MBE or 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 M/WBE availability, (ii) the geographic location of the project to the extent related to M/WBE availability, (iii) the scope of the work, (iv) the percentage of work available for subcontracting to M/WBEs and/or (v) other relevant factors, including a documented inability by the prospective Bidder to obtain commitments from M/WBE subcontractors sufficient to meet the M/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 M/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 M/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 M/WBEs. The Bidder shall also demonstrate that, where commercially reasonable, subcontracts were divided into units capable of being performed by M/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 M/WBEs to all M/WBEs qualified to perform such work. The Bidder shall identify (i) each M/WBE solicited, and (ii) each M/WBE listed in the SOMWBA 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 M/WBEs with telephone calls or personal visits in order to determine with certainty whether the M/WBEs were interested in performing the work. Phone logs or other documentation must be submitted.

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

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

The Bidder may also submit any other information supporting its request for a waiver or reduction in the M/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 M/WBEs, and/or sent written notification to M/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 M/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 M/WBE participation goals.

8.3 If filed sub-Bids are solicited for this Contract, requests from prospective general Bidders to reduce or waive the M/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 W/MBE 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 M/WBE Participation Goals For This Contract That Is Received After These Deadlines.** Any reduction or waiver of the M/WBE participation goals for this Contract will be made by written addendum mailed to all persons who have taken out plans for the project.

**8.4** 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 M/ WBE participation in amounts equal to or exceeding the M/WBE participation goals for this Contract, (ii) a completed Letter of Intent in the form provided by the Awarding Authority for each M/WBE listed in the Schedule for Participation, and (iii) a current SOMWBA certification letter for each M/WBE listed in the Schedule of M/WBE Participation showing that the M/WBE is certified in the area of work for which it is listed on the Letter of Intent.

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

**8.6** Within five (5) working days after receipt of the Schedule For M/WBE Participation, Letters of Intent, and SOMWBA 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 M/WBE Participation and appropriate Letters of Intent and SOMWBA certification letters establishing that the M/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.

**8.7** 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 M/WBE Participation.
8.8 A filed sub-Bidder is not required to submit a Schedule of M/WBE Participation with its Bid. A filed sub-Bidder may, at its option, submit a Letter of Intent with its Bid if it is a SOMWBA certified M/WBE. If a filed sub-Bidder intends to sub-subcontract work to a SOMWBA certified M/WBE, and the filed sub-Bidder wishes that sub-subcontract to be credited toward the participation goals for this Contract, the filed sub-Bidder should submit a Letter of Intent from that M/WBE with its Bid. A filed sub-Bidder can subcontract out up to 20% of its work to M/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 received 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 sub-trades 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 sub-trade 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
-Joint Venture Authorization (if appropriate)
-Performance and Payment Bonds with power of attorney attached
-Certificates of Insurance evidencing coverage 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 Contractor, 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 sub-trade, 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.
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.

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 "

ATTACHMENT A
ATTACHMENT B:

Forms Used During Bidding

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

Contractor: CONSTRUCTOR

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 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

Official DCAM Amendments Date Authorization

Extension to: ____________________________

Name: ____________________________

SPL: ____________________________

GBC SPL: ____________________________

AWL: ____________________________

Category: ____________________________

Address: ____________________________

--------------------------------------

25
Sub-Bidder Certificate of Eligibility

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 DCAM 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.

[Enter Bid Date Here]   [Enter Name of Prime/General Contractor Here]
Bid Date               Name of Prime/General Contractor

[Enter Project Number Here]   [Enter Business Address Here]
Project Number (or       Business Address
name if no number)

[Enter Name of Awarding Authority Here]   [Enter Your Telephone Number Here]
Awarding Authority       Telephone Number

SIGNATURE⇒
Bidder’s Authorized Representative

Division of Capital Asset Management
(Edit by UMass Amherst 1/19/2011)
• 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.
• Information is to cover the period from the date your most recent annual Certificate of Eligibility was issued (not extended) to the date of the bid.
• You must use this official form of Update Statement. Copies of this form may be obtained from the awarding authority and from the Asset Management Web Site: www.mass.gov/cam
• If additional space is needed, please copy the appropriate page of this Update Statement and attach it as an additional sheet.
• See the section entitled “Bidding Limits” in the Instructions to Awarding Authorities for important information concerning your bidding limits.

INSTRUCTIONS TO AWARDING AUTHORITIES

Determination of Bidder Qualifications

• It is the awarding authority’s responsibility to determine who is the lowest eligible and responsible bidder. You must consider 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 projects 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 YOUR CURRENT CERTIFICATE OF ELIGIBILITY WAS ISSUED (NOT EXTENDED). *

<table>
<thead>
<tr>
<th>PROJECT TITLE &amp; LOCATION</th>
<th>WORK CATEGORY</th>
<th>CONTRACT PRICE</th>
<th>START DATE</th>
<th>DATE COMPLETED</th>
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<tbody>
<tr>
<td>[Enter Project Title &amp; Location Here]</td>
<td>[Enter Work Category]</td>
<td>[Enter Contract Price]</td>
<td>[Enter Start Date]</td>
<td>[Date Completed]</td>
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<td>[Enter Project Title &amp; Location Here]</td>
<td>[Enter Work Category]</td>
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<td>[Enter Work Category]</td>
<td>[Enter Contract Price]</td>
<td>[Enter Start Date]</td>
<td>[Date Completed]</td>
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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.
<table>
<thead>
<tr>
<th>PROJECT TITLE</th>
<th>COMPANY NAME</th>
<th>OWNER</th>
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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.

<table>
<thead>
<tr>
<th>1</th>
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<th>8</th>
<th>9</th>
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</thead>
<tbody>
<tr>
<td>PROJECT TITLE &amp; LOCATION</td>
<td>WORK CATEGORY</td>
<td>START AND END DATES</td>
<td>ON SCHEDULE (yes / no)</td>
<td>CONTRACT PRICE</td>
<td>% NOT COMPLETE</td>
<td>$ VALUE OF WORK NOT COMPLETE (col. 5 x col. 6)</td>
<td>NO. OF YEARS REMAINING (see note below)</td>
<td>ANNUALIZED VALUE OF INCOMPLETE WORK (col. 7 ÷ col. 8) (divided by)</td>
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</table>

**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).
<table>
<thead>
<tr>
<th>PROJECT TITLE</th>
<th>COMPANY NAME</th>
<th>TELEPHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OWNER:</td>
<td>DESIGNER:</td>
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<tr>
<td>OWNER:</td>
<td>DESIGNER:</td>
<td>GC:</td>
</tr>
</tbody>
</table>

Provide the following reference information for each incomplete project listed on the previous page.
| GC: | |
|OWNER: | |
| DESIGNER: | |
| GC: | |

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 controls 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 is to cover the period from the date your most recent annual Certificate of Eligibility was issued (not extended) to the date of the bid. Include all details [project name(s) and location(s), names of all parties involved, relevant dates, etc.]. IF YOU HAVE ANY DOUBT AS TO WHETHER TO ANSWER “YES” IT IS BETTER TO BE OVER INCLUSIVE AND TO PROVIDE A DETAILED EXPLANATION.

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
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<tbody>
<tr>
<td>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?</td>
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<tr>
<td>2. Has your firm failed or refused either to perform or complete any of its work under any contract prior to substantial completion?</td>
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<tr>
<td>3. Has your firm failed or refused to complete any punch list work under any contract?</td>
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<tr>
<td>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?</td>
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<tr>
<td>5. Has your surety taken over or been asked to complete any of your work under any contract?</td>
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<tr>
<td>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?</td>
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<tr>
<td>7. Has your surety made payment to a materials supplier or other party under your payment bond on any contract?</td>
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PART 4 - Legal or Administrative Proceedings; Compliance with Laws

Please answer the following questions. Information is to cover all judicial and administrative proceedings involving bidder’s firm, which were instituted or concluded (adversely or otherwise) from the date your most recent annual Certificate of Eligibility was issued (not extended) to the date of the bid.

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.). If you have ANY DOUBT AS TO WHETHER TO ANSWER “YES” IT IS BETTER TO BE OVER INCLUSIVE AND TO PROVIDE A DETAILED EXPLANATION.

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Division of Capital Asset Management
Prime/General Contractor Update Statement Effective March 30, 2010
**PART 4 - Legal or Administrative Proceedings; Compliance with Laws (continued)**

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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.

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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.
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.

[Enter Bid Date Here] [Enter Name of Sub-bidder or Contractor]
Bid Date Print Name of Sub-bidder or Trade Contractor

[Project Number] [Enter Business Address]
Project Number (or name if no number) Business Address

[Awarding Authority] [Contractor's Telephone Number]
Awarding Authority Telephone Number

Signature
Bidder's Authorized Representative

Division of Capital Asset Management
(Etated by UMass Amherst 1/19/2011
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.
- Information is to cover the period from the date your most recent annual Sub-bidder Certificate of Eligibility was issued (not extended) to the date of the bid.
- 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/cam
- 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 YOUR CURRENT SUB-BIDDER CERTIFICATE OF ELIGIBILITY WAS ISSUED (NOT EXTENDED). *

<table>
<thead>
<tr>
<th>PROJECT TITLE &amp; LOCATION</th>
<th>WORK CATEGORY</th>
<th>CONTRACT PRICE</th>
<th>START DATE</th>
<th>DATE COMPLETED</th>
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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.

<table>
<thead>
<tr>
<th>PROJECT TITLE</th>
<th>COMPANY NAME</th>
<th>CONTACT PERSON</th>
<th>TELEPHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OWNER:</td>
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<td>DESIGNER:</td>
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<td>GC:</td>
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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.

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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT TITLE &amp; LOCATION</td>
<td>WORK CATEGORY</td>
<td>START AND END DATES</td>
<td>ON SCHEDULE (yes / no)</td>
<td>CONTRACT PRICE</td>
<td>% NOT COMPLETE</td>
<td>$ VALUE OF WORK NOT COMPLETE (col. 5 x. col. 6)</td>
</tr>
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Provide the following reference information for each incomplete project listed on the previous page.
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 is to cover the period from the date your most recent annual Sub-Bidder Certificate of Eligibility was issued (not extended) to the date of the bid. Include all details [project name(s) and location(s), names of all parties involved, relevant dates, etc.]. IF YOU HAVE ANY DOUBT AS TO WHETHER TO ANSWER “YES” IT IS BETTER TO BE OVER INCLUSIVE AND TO PROVIDE A DETAILED EXPLANATION.

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<td>2. Has your firm failed or refused either to perform or complete any of its work under any contract prior to substantial completion?</td>
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<td>3. Has your firm failed or refused to complete any punch list work under any contract?</td>
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<td>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?</td>
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<td>5. Has your surety taken over or been asked to complete any of your work under any contract?</td>
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<td>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?</td>
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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.
UNIVERSITY OF MASSACHUSETTS AMHERST

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 current 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.
General Info
Alt Total: $736,600.00

Total:
$2,087,700.00

Number
UMA17-06

Deadline
11/22/2016 02:00 PM EST

Vendor
Five Star Building Corp

Submitted
11/22/2016 01:25 PM EST Signed By Kevin Perrier

Opened
11/22/2016 02:00 PM EST By proyer@admin.umass.edu

Description
Mullins Center and Garber Field, Videoboards General Bid

Allows zero unit prices and labor
Yes

Allows negative unit prices and labor
Yes
Instructions for Electronic Bidders

Download bid book on the agency's website below and fully review before filling out your electronic bid.

Place your response to the solicitation in the below sections.

Click the "Check Bid" button to have your response reviewed for completeness.
Construction Project Listings
Access bid package information on the UMASS procurement website.
## Required Document List

<table>
<thead>
<tr>
<th>Name</th>
<th>Omission Terms</th>
<th>Submitted File</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime/General Contractor Update Statement</td>
<td>Upload completed Prime/General Contractor Update Statement</td>
<td>current statement - 11-01-16.pdf</td>
</tr>
<tr>
<td>Copy of Bid Bond or Cashier's Check</td>
<td>Upload copy of Bid Bond or Cashier's Check. If selected provide original within 48 hours of bid opening</td>
<td>bid bond - mullins &amp; garber.pdf</td>
</tr>
<tr>
<td>Subcontractor Qualification Statement</td>
<td>My company is electronically verifying our bid bond in the &quot;Electronic Bid Bond&quot; section below.</td>
<td>daktronics.pdf</td>
</tr>
</tbody>
</table>

4 Required Documents
Electronic Bid Bond

Optional: Vendor is not required to complete.

Bond Percentage
5.00%

<table>
<thead>
<tr>
<th>Bond ID *</th>
<th>Surety Agency *</th>
<th>Verify Bid Bond *</th>
</tr>
</thead>
<tbody>
<tr>
<td>No bid</td>
<td>No bid</td>
<td>No bid</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surety State *</th>
<th>Principal *</th>
</tr>
</thead>
<tbody>
<tr>
<td>No bid</td>
<td>No bid</td>
</tr>
</tbody>
</table>
Acknowledgement of Addenda

This bid includes addenda numbered (list all addenda) *

One & Two
Proposed Contract Price

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Total bid in words</th>
<th>Unit Price</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. The proposed contract price is</td>
<td>1</td>
<td>Two Million, Eighty-Seven Thousand, Seven Hundred Dollars</td>
<td>$2,087,700.00</td>
<td>$2,087,700.00</td>
</tr>
</tbody>
</table>

Total: $2,087,700.00
<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Alternate No. 1 (use negative for deduct alternates)</td>
<td>1</td>
<td>$184,400.00</td>
<td>$184,400.00</td>
</tr>
<tr>
<td>For Alternate No. 2 (use negative for deduct alternates)</td>
<td>1</td>
<td>$104,500.00</td>
<td>$104,500.00</td>
</tr>
<tr>
<td>For Alternate No. 3 (use negative for deduct alternates)</td>
<td>1</td>
<td>$447,700.00</td>
<td>$447,700.00</td>
</tr>
</tbody>
</table>

Alternate Total: $736,600.00
Total: $736,600.00
D. The subdivision of the proposed contract price is as follows:

Item 1. The work of the general contractor, being all work other than that covered by Item 2.

(approximately $1,944,974.00)
Item 2

Item 2. Sub-bids as follows: (add more items by clicking the + icon to the right up to 10 entries)

<table>
<thead>
<tr>
<th>Section #</th>
<th>Subtrade</th>
<th>Name of Sub-Bidder</th>
</tr>
</thead>
<tbody>
<tr>
<td>230,000</td>
<td>HVAC</td>
<td>Climate Heating</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>$44,200.00</td>
</tr>
</tbody>
</table>

Bonds required, indicated by "Yes" or "No"

No

If 10 entries were added above and more are needed, use this table to add up to 10 more entries (add more items by clicking the + icon to the right up to 10 entries)

<table>
<thead>
<tr>
<th>Section #</th>
<th>Subtrade</th>
<th>Name of Sub-Bidder</th>
</tr>
</thead>
<tbody>
<tr>
<td>260000</td>
<td>Electrical</td>
<td>Universal Electric</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>$96,526.00</td>
</tr>
</tbody>
</table>

Bonds required, indicated by "Yes" or "No"

No

Total of Item 2

$142,726.00

The undersigned agrees that each of the above-named sub-bidders will be used for the work indicated at the amount stated, unless a substitution is made. The undersigned further agrees to pay the premiums for the performance and payment bonds furnished by sub-bidders as requested herein and that all of the cost of all such premiums is included in the amount set forth in Item 1 of this bid.

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; provided, however, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable.

The undersigned hereby certifies that 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 hereby 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 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 hereby certifies under penalties of perjury that:
- this bid is in all respects bona fide, fair and made without collusion or fraud with any other person;
- 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 informalty and to receive said data subsequently within a reasonable time as set by the Awarding Authority.

Date *
November 22, 2016

(Name of General Bidder) *
Five Star Building Corp
The following information is furnished by the Bidder for the information of the University of Massachusetts Amherst.

Is Bidder a corporation? *
Yes

If so, incorporated in what state?
Massachusetts

President
Kevin Perrier

Secretary or Clerk
Kevin Perrier

Treasurer
Kevin Perrier

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

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? *
No

Is Bidder a limited partnership? *
No

Is Bidder registered in Massachusetts? *
Yes

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 (add additional tables if necessary by clicking the + icon)
Name of corporation
Five Star Building Corp

State of incorporation
Massachusetts

President
Kevin Perrier

Secretary or Clerk
Kevin Perrier

Treasurer
Kevin Perrier

Is Bidder an individual? *
No

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.
FORM FOR GENERAL BID

To the Awarding Authority:

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

UMA No. 17-06 Project No. 1008489

Project Name: Mullens Center and Garber Field, Videoboards

in Amherst, Massachusetts, in accordance with the accompanying plans and specifications prepared by ____________________________________________________________________________ (name of architect or engineer) 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 ($ ________________).

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 ____________________________________________________________________________
D. The subdivision of the proposed contract price is as follows:

Item 1. The work of the general contractor, being all work other than that covered by Item 2.

(\text{total bid in words})

\textbf{Item 2. Sub-bids as follows:}

<table>
<thead>
<tr>
<th>Section #</th>
<th>Subtrade</th>
<th>Name of Sub-Bidder</th>
<th>Amount</th>
<th>Bonds required, indicated by &quot;Yes&quot; or &quot;No&quot;</th>
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</table>

52
The undersigned agrees that each of the above-named sub-bidders will be used for the work indicated at the amount stated, unless a substitution is made. The undersigned further agrees to pay the premiums for the performance and payment bonds furnished by sub-bidders as requested herein and that all of the cost of all such premiums is included in the amount set forth in Item 1 of this bid.

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; provided, however, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable.

The undersigned hereby certifies that 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.
VIDEO BOARDS SUBCONTRACTOR QUALIFICATION STATEMENT

GENERAL BIDDERS MUST INCLUDE THIS FORM WITH BID

1. General: This project requires a qualified video board contractor or subcontractor, whose responsibilities shall include the work indicated in specification Section 115200 Special Systems.

2. Video Board Subcontractor Qualifications: An experienced installer of complete video board systems and products who has completed video board installations similar in material, design, and extent to that indicated for Project, and whose work has resulted in construction with a record of successful in-service performance. Minimum demonstrated experience includes:
   - No less than three (3) video board projects of equivalent size and scope completed within the last five (5) years.
   - No less than one (1) facility where the proposed subcontractor has provided equipment and services of equivalent size and scope that is at least five (5) years old.
   - Must provide a Letter of Surety from their bonding agent, stating their ability to provide a 100% payment and performance bond if they are the successful subcontractor.
   - Shall have a direct service employee or certified contractor capable of providing maintenance response within eight (8) hours of a call for service.

3. For each proposed Video Board Subcontractor the General Contractor shall complete the following form and provide the additional information to demonstrate the capabilities and experience of the proposed Subcontractor as outlined above to be reviewed and deemed qualified:
   - Evidence of video board manufacturer's approval of Video Board Subcontractor for this Project, signed by video board manufacturer on manufacturer's letterhead.
   - Copy of Letter of Surety from videoboard subcontractor's bonding agent as noted above.
   - Evidence of video board manufacturer's service vendor certification (if not self-performing with their own direct service employees) for this Project, signed by videoboard manufacturer on manufacturer's letterhead.

Name of Proposed Video Board Subcontractor: Daktronics
Name of Proposed Video Board Manufacturer: Daktronics
(This name should match the letterhead noting approval of the video board subcontractor to install their product.)
Name of Proposed Video Board Service Vendor: Self Performing Service
(If video board subcontractor has their own direct service employees, then please note "Self-Performing Service").

Surety Letter from Bonding Agent Attachment Acknowledgement: Yes
Similar Project Experience Listing:

Similar Project within Last Five Years #1:
- Project Name: University of New Hampshire – Whittemore Center
- Project Location: Durham, New Hampshire
- Description: Centerhung LED Video Display, LED Ribbon Displays, Scoring and Timing Systems, Video Control Room. First LED video project in school history.
- Date of Project Completion/Beneficial Use: August 2015
- Owner Contact (Name, Company, & Phone): Steve Metcalf, UNH Deputy Athletic Director, 603-862-2596
- Designer Contact (Name, Company, & Phone): Royce Wall, Anthony James Partners (AJP), 757-636-3139
- Contractor Contact (Name, Company, & Phone): Thomas Westman, Daktronics, 605-651-2385

Similar Project within Last Five Years #2:
- Project Name: Colgate University – New Hockey Arena
- Project Location: Hamilton, NY
- Description: Centerhung LED Video Display, Scoring and Timing System.
- Date of Project Completion/Beneficial Use: September 2016
- Owner Contact (Name, Company, & Phone): Ann-Marie Guglieri, Sr. Associate Director of Athletics, Colgate University, 315-228-7852
- Designer Contact (Name, Company, & Phone): Thomas Westman, Daktronics, 605-651-2385
- Contractor Contact (Name, Company, & Phone): Thomas Westman, Daktronics, 605-651-2385

Similar Project within Last Five Years #3:
- Project Name: University of Kentucky – Rupp Arena
- Project Location: Lexington, KY
- Description: Centerhung LED Video Display, Hoist, LED Ribbon Displays, Scoring and Timing System, LED Scorers Tables, Auxiliary Video Displays for Arena Corners
- Date of Project Completion/Beneficial Use: October, 2016
- Owner Contact (Name, Company, & Phone): Bob Stoops, Rupp Arena, Technical Services Manager
- Designer Contact (Name, Company, & Phone): Frank Moraski, Anthony James Partners (AJP), 914-441-6606
- Contractor Contact (Name, Company, & Phone): Trevor Moser, Daktronics, 605-691-1835
Similar Project Older than Five Years:
- Project Name: Boston College – Alumni Hall (Basketball and Hockey)
- Project Location: Chestnut Hill, MA
- Description: LED End Wall Video Displays, Scoring and Timing, Fixed Digit Scoreboards, LED Scorers Tables, Shot Clocks, Locker Room Clocks
- Date of Project Completion/Beneficial Use: August 2010
- Owner Contact (Name, Company, & Phone): Will Gartner, Associate Director of Athletics, Boston College, 857-231-2766
- Designer Contact (Name, Company, & Phone): Daktronics Designed
- Contractor Contact (Name, Company, & Phone): Thomas Westman, Daktronics, 605-651-2385

Similar Project Older than Five Years:
- Project Name: Dunkin Donuts Center
- Project Location: Providence, RI
- Description: Centerhung Video Display, Scoreboards, LED Scorers Tables, Shot Clocks, Locker Room Clocks
- Date of Project Completion/Beneficial Use: August 2007
- Owner Contact (Name, Company, & Phone): Bob Lauro, Director of Operations, 401-255-9979
- Designer Contact (Name, Company, & Phone): Daktronics Designed
- Contractor Contact (Name, Company, & Phone): Thomas Westman, Daktronics, 605-651-2385
CONTRACTOR
(Name, legal status and address):
Daktronics, Inc.
201 Daktronics Drive
Brookings, SD 57006

OWNER
(Name, legal status and address):
University of Massachusetts
Mass Venture Way, Room 334
Hadley, MA 01035

SURETY (Name, legal status and principal place of business):
Federal Insurance Company
15 Mountain View Road
Warren, N.J. 07059

BOND AMOUNT:
5% Five Percent of Amount Bid

PROJECT:
(Name, location or address, and Project number, if any)
Mullins Center and Garber Field Videoboards - Contract No. UMA 17-08; Project No. 1008

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 15th day of November, 2016

Daktronics, Inc.

By: Pam Schmidt, Risk Manager

Federal Insurance Company

By: Amy M. Burns

(Witness)

(Witness)
SECRETARY'S CERTIFICATE

I, Carla S. Gatzke, do hereby certify that: I am the Secretary of Daktronics Inc. (hereinafter the "Corporation;") and that as such I am authorized to execute this certificate on behalf of the Corporation in my capacity as the Secretary of the Corporation and do hereby certify that the Amended and Restated Bylaws of Daktronics Inc. Article VII, Section 8.3, state that the Corporation shall have no corporate seal. Amended and Restated Bylaws of Daktronics were submitted with our form 10-K fiscal year 2013.

Carla S. Gatzke, Secretary

TO ALL TO WHOM THESE shall come, I, Audrey L. Kress, NOTARY PUBLIC duly authorized, admitted and sworn, practicing at South Dakota, United States America. DO HEREBY CERTIFY that:

The above signature is Daktronics Secretary, Carla Gatzke is indeed true and original.

IN TESTIMONY where I have
Subscribed my name and affixed
My Seal of Office this 19th day of May, 2015

Audrey Kress
Notary Public
County of Brookings
State of South Dakota

AUDREY KRESS
NOTARY PUBLIC
SOUTH DAKOTA
My Commission Expires 1/5/2018
CORPORATE ACKNOWLEDGMENT

STATE OF South Dakota

COUNTY OF Brookings

On this 15th day of November, 2016 before me personally appeared Pam Schmidt, to me known, who being by me duly sworn, that he/she is the Risk Manager of the Daktronics, Inc. the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation; and that he/she signed his/her name thereto by like order.

NICHOLE F. HOFER
Notary Public
(My Commission Expires 31 March 2017)

ACKNOWLEDGMENT OF CORPORATE SURETY

STATE OF Minnesota

COUNTY OF Hennepin

On this 15th day of November, 2016 before me appeared Amy M. Burns to be known, who being by me duly sworn, did say that she is the aforesaid Attorney-in-Fact of the Federal Insurance Company, a corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation, and that said instrument was signed and sealed on behalf of said corporation by the aforesaid officer, by authority of its Board of directors; and the aforesaid officer acknowledged said instrument to be the free act and deed of said corporation.

BARBARA L. RADEKE
Notary Public
(My Commission Expires 06/30/2020)
Know All by These Presents, That FEDERAL INSURANCE COMPANY, an Indiana corporation, VIGILANT INSURANCE COMPANY, a New York corporation, and PACIFIC INDEMNITY COMPANY, a Wisconsin corporation, do each hereby constitute and appoint

Amy M. Burns

as their true and lawful Attorney-In-Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surely thereon or otherwise, the following Surety Bond:

Surety Bond Number: Bid Bond

Obligee: University of Massachusetts

And the execution of such bond or obligation by such Attorney-In-Fact in the Company's name and on its behalf as surely thereon or otherwise, under its corporate seal, in pursuance of the authority hereby conferred shall, upon delivery thereof, be valid and binding upon the Company.

In Witness Whereof, said FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY have each executed and affixed these presents and affixed their corporate seals on the 1st day of March 2013.

Dawn M. Chloros, Assistant Secretary

Richard A. Ciullo, Vice President

STATE OF NEW JERSEY

County of Somerset

On this 1st day of March 2013 before me, a Notary Public of New Jersey, personally came Dawn M. Chloros, to me known to be Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY, the companies which executed the foregoing Power of Attorney, and the said Dawn M. Chloros, being by me duly sworn, did depose and say that she is Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY and knows the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are corporate seals and were thereto affixed by authority of the By-Laws of said Companies; and that she signed said Power of Attorney as Assistant Secretary of said Companies by like authority; and that she is acquainted with Richard A. Ciullo, and knows him to be Vice President of said Companies; and that the signature of Richard A. Ciullo, subscribed to said Power of Attorney in the genuine handwriting of Richard A. Ciullo, and was thereto subscribed by authority of said By-Laws and in deponent's presence.

Notarial Seal

WENDIE WALSH

Notary Public, State of New Jersey

No. 0054604

Expires April 18, 2018

CERTIFICATION

Extract from the By-Laws of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY:

"All powers of attorney for and on behalf of the Company may and shall be executed in the name and on behalf of the Company, either by the Chairman or the President or a Vice President or an Assistant Vice President, Jointly with the Secretary or an Assistant Secretary, under their respective designations. The signature of such officers may be engraved, printed or lithographed. The signature of each of the following officers: Chairman, President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary and the seal of the Company may be affixed to any power of attorney or to any certificate relating thereto appointing Assistant Secretaries or Attorneys-In-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such power of attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding upon the Company with respect to any bond or undertaking to which it is attached."

I, Dawn M. Chloros, Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY (the "Companies") do hereby certify that

1. the foregoing extract of the By-Laws of the Companies is true and correct,

2. the Companies are duly licensed and authorized to transact surety business in all 50 of the United States of America and the District of Columbia and are authorized by the U.S. Treasury Department, further, Federal and Vigilant are licensed in Puerto Rico and the U.S. Virgin Islands, and Federal is licensed in American Samoa, Guam, and each of the Provinces of Canada except Prince Edward Island; and

3. the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Warren, N.J the 15th day of November, 2016.

Dawn M. Chloros, Assistant Secretary

IN THE EVENT YOU WISH TO NOTIFY US OF A CLAIM, VERIFY THE AUTHENTICITY OF THIS BOND OR NOTIFY US OF ANY OTHER MATTER, PLEASE CONTACT US AT ADDRESS LISTED ABOVE, OR BY TELEPHONE (908) 903-3493 FAX (908) 903-3656 e-mail: surety@chubb.com

Form 15-10-01548-SomePath (Rev. 03-13) CORP CONSENT
### COVERS EAGES

**Certificate Number:** 47750633  
**Revision Number:**

This is to certify that the policies of insurance listed below have been issued to the insured named above for the policy period indicated. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, the insurance afforded by the policies described herein is subject to all the terms, exclusions and conditions of such policies. Limits shown may have been reduced by paid claims.

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**Description of Operations / Locations / Vehicles (ACORD 101, Additional Remarks Schedule, may be attached if more space is required):**

**Certificate Holder**

- Evidence of Coverage  
- For bidding purposes only

**Cancellation**

- Should any of the above described policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions.

**Authorized Representative**

© 1988-2014 ACORD CORPORATION. All rights reserved.
This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

GENERAL DESCRIPTION OF COVERAGE – This endorsement broadens coverage. However, coverage for any injury, damage or medical expenses described in any of the provisions of this endorsement may be excluded or limited by another endorsement to this Coverage Part, and these coverage broadening provisions do not apply to the extent that coverage is excluded or limited by such an endorsement. The following listing is a general coverage description only. Limitations and exclusions may apply to these coverages. Read all the provisions of this endorsement and the rest of your policy carefully to determine rights, duties, and what is and is not covered.

A. Reasonable Force Property Damage – Exception To Expected Or Intended Injury Exclusion
B. Non-Owned Watercraft Less Than 75 Feet
C. Aircraft Chartered With Pilot
D. Damage To Premises Rented To You
E. Increased Supplementary Payments
F. Who Is An Insured – Employees And Volunteer Workers – First Aid
G. Who Is An Insured – Employees – Supervisory Positions
H. Who Is An Insured – Newly Acquired Or Formed Organizations
I. Blanket Additional Insured – Owners, Managers Or Lessors Of Premises
J. Blanket Additional Insured – Lessors Of Leased Equipment
K. Blanket Additional Insured – Persons Or Organizations For Your Ongoing Operations As Required By Written Contract Or Agreement
L. Blanket Additional Insured – Broad Form Vendors
M. Who Is An Insured – Unnamed Subsidiaries
N. Who Is An Insured – Liability For Conduct Of Unnamed Partnerships Or Joint Ventures
O. Medical Payments – Increased Limits
P. Contractual Liability – Increased Limits
Q. Knowledge And Notice Of Occurrence Or Offense
R. Unintentional Omission
S. Blanket Waiver Of Subrogation

PROVISIONS

A. REASONABLE FORCE PROPERTY DAMAGE – EXCEPTION TO EXPECTED OR INTENDED INJURY EXCLUSION

The following replaces Exclusion a., Expected Or Intended Injury, in Paragraph 2., of SECTION I – COVERAGE – COVERAGE A BODILY INJURY AND PROPERTY DAMAGE LIABILITY:

a. Expected Or Intended Injury Or Damage

"Bodily injury" or "property damage" expected or intended from the standpoint of the insured. This exclusion does not apply to "bodily injury" or "property damage" resulting from the use of reasonable force to protect any person or property.

B. NON-OWNED WATERCRAFT LESS THAN 75 FEET

The following replaces Paragraph (2) of Exclusion g., Aircraft, Auto Or Watercraft, in Paragraph 2. of SECTION I – COVERAGE – COVERAGE A BODILY INJURY AND PROPERTY DAMAGE LIABILITY:

(2) A watercraft you do not own that is:

(a) Less than 75 feet long; and
(b) Not being used to carry any person or property for a charge.

C. AIRCRAFT CHARTERED WITH PILOT

The following is added to Exclusion g., Aircraft, Auto Or Watercraft, in Paragraph 2. of SECTION
Commercial General Liability

I - Coverages - Coverage A Bodily Injury and Property Damage Liability:
This exclusion does not apply to an aircraft that is:
(a) Chartered with a pilot to any insured;
(b) Not owned by any insured; and
(c) Not being used to carry any person or property for a charge.

D. Damage to Premises Rented to You

1. The first paragraph of the exceptions in Exclusion J., Damage To Property, in Paragraph 2. of SECTION I - COVERAGES - COVERAGE A BODILY INJURY AND PROPERTY DAMAGE LIABILITY is deleted.

2. The following replaces the last paragraph of Paragraph 2., Exclusions, of SECTION I - COVERAGES - COVERAGE A BODILY INJURY AND PROPERTY DAMAGE LIABILITY:

Exclusions c., g. and h., and Paragraphs (1), (3) and (4) of Exclusion j., do not apply to "premises damage". Exclusion f.1(a) does not apply to "premises damage" caused by fire unless Exclusion f. of Section I - Coverage A - Bodily Injury And Property Damage Liability is replaced by another endorsement to this Coverage Part that has Exclusion - All Pollution Injury Or Damage or Total Pollution Exclusion in its title. A separate limit of insurance applies to "premises damage" as described in Paragraph 6. of Section III - Limits Of Insurance.

3. The following replaces Paragraph 6. of SECTION III - LIMITS OF INSURANCE:

6. Subject to 5. above, the Damage To Premises Rented To You Limit is the most we will pay under Coverage A for damages because of "premises damage" to any one premises.

The Damage To Premises Rented To You Limit will be:

a. The amount shown for the Damage To Premises Rented To You Limit on the Declarations of this Coverage Part; or
b. $300,000 if no amount is shown for the Damage To Premises Rented To You Limit on the Declarations of this Coverage Part.

4. The following replaces Paragraph a. of the definition of "insured contract" in the DEFINITIONS Section:

a. A contract for a lease of premises. However, that portion of the contract for a lease of premises that indemnifies any person or organization for "premises damage" is not an "insured contract";

5. The following is added to the DEFINITIONS Section:

"Premises damage" means "property damage" to:

a. Any premises while rented to you or temporarily occupied by you with permission of the owner; or
b. The contents of any premises while such premises is rented to you, if you rent such premises for a period of seven or fewer consecutive days.

6. The following replaces Paragraph 4.b.(1) of SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS:

(b) That is insurance for "premises damage";

or

7. Paragraph 4.b.(1)(c) of SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS is deleted.

E. Increased Supplementary Payments

1. The following replaces Paragraph 1.b. of SUPPLEMENTARY PAYMENTS - COVERAGES A AND B of SECTION I - COVERAGES:

b. Up to $2,500 for cost of bail bonds required because of accidents or traffic law violations arising out of the use of any vehicle to which the Bodily Injury Liability Coverage applies. We do not have to furnish these bonds.

2. The following replaces Paragraph 1.d. of SUPPLEMENTARY PAYMENTS - COVERAGES A AND B of SECTION I - COVERAGES:

d. All reasonable expenses incurred by the insured at our request to assist us in the investigation or defense of the claim or "suit", including actual loss of earnings up to $500 a day because of time off from work.
F. WHO IS AN INSURED – EMPLOYEES AND VOLUNTEER WORKERS – FIRST AID

1. The following is added to the definition of "occurrence" in the DEFINITIONS Section:

Unless you are in the business or occupation of providing professional health care services, "occurrence" also means an act or omission committed by any of your "employees" or "volunteer workers", other than an employed or volunteer doctor, in providing or failing to provide first aid or "Good Samaritan services" to a person.

2. The following is added to Paragraph 2.a.(1) of SECTION II – WHO IS AN INSURED:

Unless you are in the business or occupation of providing professional health care services, Paragraphs (1)(a), (b), (c) and (d) above do not apply to "bodily injury" arising out of providing or failing to provide first aid or "Good Samaritan services" by any of your "employees" or "volunteer workers", other than an employed or volunteer doctor. Any of your "employees" or "volunteer workers" providing or failing to provide first aid or "Good Samaritan services" during their work hours for you will be deemed to be acting within the scope of their employment by you or performing duties related to the conduct of your business.

3. The following is added to Paragraph 5. of SECTION III – LIMITS OF INSURANCE:

For the purposes of determining the applicable Each Occurrence Limit, all related acts or omissions committed by any of your "employees" or "volunteer workers" in providing or failing to provide first aid or "Good Samaritan services" to any one person will be deemed to be one "occurrence".

4. The following is added to the DEFINITIONS Section:

"Good Samaritan services" means any emergency medical services for which no compensation is demanded or received.

G. WHO IS AN INSURED – EMPLOYEES – SUPERVISORY POSITIONS

The following is added to Paragraph 2.a.(1) of SECTION II – WHO IS AN INSURED:

Paragraphs (1)(a), (b) and (c) above do not apply to "bodily injury" or "personal injury" to a co-"employee" in the course of the co-"employee's" employment by you arising out of work by any of your "employees" who hold a supervisory position.

H. WHO IS AN INSURED – NEWLY ACQUIRED OR FORMED ORGANIZATIONS

The following replaces Paragraph 4. of SECTION II – WHO IS AN INSURED of the Commercial General Liability Coverage Form, and Paragraph 3. of SECTION II – WHO IS AN INSURED of the Global Companion Commercial General Liability Coverage Form, to the extent such coverage forms are part of your policy:

Any organization you newly acquire or form, other than a partnership or joint venture, of which you are the sole owner or in which you maintain the majority ownership interest, will qualify as a Named Insured if there is no other insurance which provides similar coverage to that organization. However:

a. Coverage under this provision is afforded only:

(1) Until the 180th day after you acquire or form the organization or the end of the policy period, whichever is earlier, if you do not report such organization in writing to us within 180 days after you acquire or form it; or

(2) Until the end of the policy period, when that date is later than 180 days after you acquire or form such organization, if you report such organization in writing to us within 180 days after you acquire or form it, and we agree in writing that it will continue to be a Named Insured until the end of the policy period;

b. Coverage A does not apply to "bodily injury" or "property damage" that occurred before you acquired or formed the organization; and

c. Coverage B does not apply to "personal injury" or "advertising injury" arising out of an offense committed before you acquired or formed the organization.

I. BLANKET ADDITIONAL INSURED – OWNERS, MANAGERS OR LESSORS OF PREMISES

The following is added to SECTION II – WHO IS AN INSURED:

Any person or organization that is a premises owner, manager or lessor is an insured, but only with respect to liability arising out of the ownership, maintenance or use of that part of any premises leased to you.

The insurance provided to such premises owner, manager or lessor does not apply to:
COMMERCIAL GENERAL LIABILITY

a. Any "bodily injury" or "property damage" caused by an "occurrence" that takes place, or "personal injury" or "advertising injury" caused by an offense that is committed, after you cease to be a tenant in that premises; or

b. Structural alterations, new construction or demolition operations performed by or on behalf of such premises owner, manager or lessor.

J. BLANKET ADDITIONAL INSURED - LESSORS OF LEASED EQUIPMENT

The following is added to SECTION II - WHO IS AN INSURED:

Any person or organization that is an equipment lessor is an insured, but only with respect to liability for "bodily injury", "property damage", "personal injury" or "advertising injury" caused, in whole or in part, by your acts or omissions in the maintenance, operation or use by you of equipment leased to you by such equipment lessor.

The insurance provided to such equipment lessor does not apply to any "bodily injury" or "property damage" caused by an "occurrence" that takes place, or "personal injury" or "advertising injury" caused by an offense that is committed, after the equipment lease expires.

K. BLANKET ADDITIONAL INSURED - PERSONS OR ORGANIZATIONS FOR YOUR ONGOING OPERATIONS AS REQUIRED BY WRITTEN CONTRACT OR AGREEMENT

The following is added to SECTION II - WHO IS AN INSURED:

Any person or organization that is not otherwise an insured under this Coverage Part and that you have agreed in a written contract or agreement to include as an additional insured on this Coverage Part is an insured, but only with respect to liability for "bodily injury" or "property damage" that:

a. Is caused by an "occurrence" that takes place after you have signed and executed that contract or agreement; and

b. Arises out of "your products" which are distributed or sold in the regular course of such vendor's business.

The insurance provided to such vendor is subject to the following provisions:

a. The limits of insurance provided to such vendor will be the limits which you agreed to provide in the written contract or agreement, or the limits shown in the Declarations, whichever are less.

b. The insurance provided to such vendor does not apply to:
   (1) Any express warranty not authorized by you;
   (2) Any change in "your products" made by such vendor;
   (3) Repackaging, unless unpacked solely for the purpose of inspection, demonstration, testing, or the substitution of parts under instructions from the manufacturer, and then repackaged in the original container;
   (4) Any failure to make such inspections, adjustments, tests or servicing as vendors agree to perform or normally undertake to perform in the regular course of business, in connection with the distribution or sale of "your products";
   (5) Demonstration, installation, servicing or repair operations, except such operations performed at such vendor's premises in connection with the sale of "your products"; or
   (6) "Your products" which, after distribution or sale by you, have been labeled or relabeled or used as a container, part or ingredient of any other thing or substance by or on behalf of such vendor.

L. BLANKET ADDITIONAL INSURED - BROAD FORM VENDORS

The following is added to SECTION II - WHO IS AN INSURED:

Any person or organization that is a vendor and that you have agreed in a written contract or agreement to include as an additional insured on this Coverage Part is an insured, but only with respect to liability for "bodily injury" or "property damage" that:

a. Is caused by an "occurrence" that takes place after you have signed and executed that contract or agreement; and

b. Arises out of "your products" which are distributed or sold in the regular course of such vendor's business.

The insurance provided to such vendor is subject to the following provisions:

a. The limits of insurance provided to such vendor will be the limits which you agreed to provide in the written contract or agreement, or the limits shown in the Declarations, whichever are less.

b. The insurance provided to such vendor does not apply to:
   (1) Any express warranty not authorized by you;
   (2) Any change in "your products" made by such vendor;
   (3) Repackaging, unless unpacked solely for the purpose of inspection, demonstration, testing, or the substitution of parts under instructions from the manufacturer, and then repackaged in the original container;
   (4) Any failure to make such inspections, adjustments, tests or servicing as vendors agree to perform or normally undertake to perform in the regular course of business, in connection with the distribution or sale of "your products";
   (5) Demonstration, installation, servicing or repair operations, except such operations performed at such vendor's premises in connection with the sale of "your products"; or
   (6) "Your products" which, after distribution or sale by you, have been labeled or relabeled or used as a container, part or ingredient of any other thing or substance by or on behalf of such vendor.
Coverage under this provision does not apply to:

a. Any person or organization from whom you have acquired "your products", or any ingredient, part or container entering into, accompanying or containing such products; or

b. Any vendor for which coverage as an additional insured specifically is scheduled by endorsement.

M. WHO IS AN INSURED – UNNAMED SUBSIDIARIES

The following is added to SECTION II – WHO IS AN INSURED:

Any of your subsidiaries, other than a partnership or joint venture, that is not shown as a Named Insured in the Declarations is a Named Insured if:

a. You maintain an ownership interest of more than 50% in such subsidiary on the first day of the policy period; and

b. Such subsidiary is not an insured under similar other insurance.

No such subsidiary is an insured for "bodily injury" or "property damage" that occurred, or "personal injury" or "advertising injury" caused by an offense committed:

a. Before you maintained an ownership interest of more than 50% in such subsidiary; or

b. After the date, if any, during the policy period that you no longer maintain an ownership interest of more than 50% in such subsidiary.

N. WHO IS AN INSURED – LIABILITY FOR CONDUCT OF UNNAMED PARTNERSHIPS OR JOINT VENTURES

The following replaces the last paragraph of SECTION II – WHO IS AN INSURED:

No person or organization is an insured with respect to the conduct of any current or past partnership or joint venture that is not shown as a Named Insured in the Declarations. This paragraph does not apply to any such partnership or joint venture that otherwise qualifies as an insured under Section II – Who Is An Insured.

O. MEDICAL PAYMENTS – INCREASED LIMITS

The following replaces Paragraph 7. of SECTION III – LIMITS OF INSURANCE:

7. Subject to 5. above, the Medical Expense Limit is the most we will pay under Coverage C for all medical expenses because of "bodily injury" sustained by any one person, and will be the higher of:

(a) $10,000; or

(b) The amount shown on the Declarations of this Coverage Part for Medical Expense Limit.

P. CONTRACTUAL LIABILITY – RAILROADS

1. The following replaces Paragraph c. of the definition of "insured contract" in the DEFINITIONS Section:

c. Any easement or license agreement;

2. Paragraph f.(1) of the definition of "insured contract" in the DEFINITIONS Section is deleted.

Q. KNOWLEDGE AND NOTICE OF OCCURRENCE OR OFFENSE

The following is added to Paragraph 2., Duties In The Event of Occurrence, Offense, Claim or Suit, of SECTION IV – COMMERCIAL GENERAL LIABILITY CONDITIONS:

e. The following provisions apply to Paragraph a. above, but only for the purposes of the insurance provided under this Coverage Part to you or any insured listed in Paragraph 1. or 2. of Section II – Who Is An Insured:

(1) Notice to us of such "occurrence" or offense must be given as soon as practicable only after the "occurrence" or offense is known to you (if you are an individual), any of your partners or members who is an individual (if you are a partnership or joint venture), any of your managers who is an individual (if you are a limited liability company), any of your trustees who is an individual (if you are a trust), any of your "executive officers" or directors (if you are an organization other than a partnership, joint venture, limited liability company or trust) or any "employee" authorized by you to give notice of an "occurrence" or offense.

(2) If you are a partnership, joint venture, limited liability company or trust, and none of your partners, joint venture members, managers or trustees are individuals, notice to us of such "occurrence" or offense must be given as soon as practicable only after the "occurrence" or offense is known by:

(a) Any individual who is:

   (i) A partner or member of any partnership or joint venture;

   (ii) A manager of any limited liability company;
(iii) A trustee of any trust; or
(iv) An executive officer or director of any other organization;
that is your partner, joint venture member, manager or trustee; or
(b) Any "employee" authorized by such partnership, joint venture, limited liability company, trust or other organization to give notice of an "occurrence" or offense.

(3) Notice to us of such "occurrence" or offense will be deemed to be given as soon as practicable if it is given in good faith as soon as practicable to your workers' compensation insurer. This applies only if you subsequently give notice to us of the "occurrence" or offense as soon as practicable after any of the persons described in Paragraphs e. (1) or (2) above discovers that the "occurrence" or offense may result in sums to which the insurance provided under this Coverage Part may apply.

However, if this policy includes an endorsement that provides limited coverage for "bodily injury" or "property damage" or pollution costs arising out of a discharge, release or escape of "pollutants" which contains a requirement that the discharge, release or escape of "pollutants" must be reported to us within a specific number of days after its abrupt commencement, this Paragraph e. does not affect that requirement.

R. UNINTENTIONAL OMISSION
The following is added to Paragraph 6., Representations, of SECTION IV — COMMERCIAL GENERAL LIABILITY CONDITIONS:

The unintentional omission of, or unintentional error in, any information provided by you which we relied upon in issuing this policy will not prejudice your rights under this insurance. However, this provision does not affect our right to collect additional premium or to exercise our rights of cancellation or nonrenewal in accordance with applicable insurance laws or regulations.

S. BLANKET WAIVER OF SUBROGATION
The following is added to Paragraph 8., Transfer Of Rights Of Recovery Against Others To Us, of SECTION IV — COMMERCIAL GENERAL LIABILITY CONDITIONS:

If the insured has agreed in a contract or agreement to waive that insured's right of recovery against any person or organization, we waive our right of recovery against such person or organization, but only for payments we make because of:

a. "Bodily injury" or "property damage" caused by an "occurrence" that takes place; or
b. "Personal injury" or "advertising injury" caused by an offense that is committed;

subsequent to the execution of the contract or agreement.
This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

1. The following is added to SECTION II – WHO IS AN INSURED:

   Any person or organization that:

   a. You agree in a "written contract requiring insurance" to include as an additional insured on this Coverage Part; and
   b. Has not been added as an additional insured for the same project by attachment of an endorsement under this Coverage Part which includes such person or organization in the endorsement's schedule;

   is an insured, but:

   a. Only with respect to liability for "bodily injury", "property damage" or "personal injury"; and
   b. Only as described in Paragraph (1), (2) or (3) below, whichever applies:

   (1) If the "written contract requiring insurance" specifically requires you to provide additional insured coverage to that person or organization by the use of:

      a. The Additional Insured – Owners, Lessees or Contractors – (Form B) endorsement CG 20 10 11 85; or
      b. Either or both of the following: the Additional Insured – Owners, Lessees or Contractors – Completed Operations endorsement CG 20 37 10 01; or

   (2) If the "written contract requiring insurance" specifically requires you to provide additional insured coverage to that person or organization by the use of:

      a. The Additional Insured – Owners, Lessees or Contractors – Scheduled Person or Organization endorsement CG 20 10 07 04 or CG 20 10 04 13, the Additional Insured – Owners, Lessees or Contractors – Completed Operations endorsement CG 20 37 07 04 or CG 20 37 04 13, or both of such endorsements with either of those edition dates; or
      b. Either or both of the following: the Additional Insured – Owners, Lessees or Contractors – Completed Operations endorsement CG 20 37, without an edition date of such endorsement specified;

   (3) If neither Paragraph (1) nor (2) above applies:

      a. The person or organization is an additional insured only if the injury or damage is caused, in whole or in part, by acts or omissions of you or your subcontractor in the performance of "your work" to which the "written contract requiring insurance" applies; or
      b. The person or organization does not qualify as an additional insured with respect to the independent acts or omissions of such person or organization.
2. The insurance provided to the additional insured by this endorsement is limited as follows:

   a. If the Limits of Insurance of this Coverage Part shown in the Declarations exceed the minimum limits of liability required by the "written contract requiring insurance", the insurance provided to the additional insured will be limited to such minimum required limits of liability. For the purposes of determining whether this limitation applies, the minimum limits of liability required by the "written contract requiring insurance" will be considered to include the minimum limits of liability of any Umbrella or Excess liability coverage required for the additional insured by that "written contract requiring insurance". This endorsement will not increase the limits of insurance described in Section III - Limits Of Insurance.

   b. The insurance provided to the additional insured does not apply to "bodily injury", "property damage" or "personal injury" arising out of the rendering of, or failure to render, any professional architectural, engineering or surveying services, including:

      (1) The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders or change orders, or the preparing, approving, or failing to prepare or approve, drawings and specifications; and

      (2) Supervisory, inspection, architectural or engineering activities.

   c. The insurance provided to the additional insured does not apply to "bodily injury" or "property damage" caused by "your work" and included in the "products-completed operations hazard" unless the "written contract requiring insurance" specifically requires you to provide such coverage for that additional insured during the policy period.

3. The insurance provided to the additional insured by this endorsement is excess over any valid and collectible other insurance, whether primary, excess, contingent or on any other basis, that is available to the additional insured when that person or organization is an additional insured, or is any other insured that does not qualify as a named insured, under such other insurance.

4. As a condition of coverage provided to the additional insured by this endorsement:

   a. The additional insured must give us written notice as soon as practicable of an "occurrence" or an offense which may result in a claim. To the extent possible, such notice should include:

      (1) How, when and where the "occurrence" or offense took place;

      (2) The names and addresses of any injured persons and witnesses; and

      (3) The nature and location of any injury or damage arising out of the "occurrence" or offense.

   b. If a claim is made or "suit" is brought against the additional insured, the additional insured must:

      (1) Immediately record the specifics of the claim or "suit" and the date received; and

      (2) Notify us as soon as practicable. The additional insured must see to it that we receive written notice of the claim or "suit" as soon as practicable.

   c. The additional insured must immediately send us copies of all legal papers received in connection with the claim or "suit", cooperate with us in the investigation or settlement of the claim or defense against the "suit", and otherwise comply with all policy conditions.

   d. The additional insured must tender the defense and indemnity of any claim or "suit" to any provider of other insurance which would cover the additional insured for a loss we cover under this endorsement. However, this condition does not affect whether the insurance provided to the additional insured by this endorsement is primary to other insurance available to the additional insured which covers that person or organization as a named insured as described in Paragraph 3. above.

5. The following is added to the DEFINITIONS Section:

"Written contract requiring Insurance" means that part of any written contract or agreement under which you are required to include a person or or-
ganization as an additional insured on this Coverage Part, provided that the "bodily injury" and "property damage" occurs, and the "personal injury" is caused by an offense committed, during the policy period and:

a. After the signing and execution of the contract or agreement by you; and
b. While that part of the contract or agreement is in effect.
BUSINESS AUTO EXTENSION ENDORSEMENT

This endorsement modifies insurance provided under the following:
BUSINESS AUTO COVERAGE FORM

GENERAL DESCRIPTION OF COVERAGE — This endorsement broadens coverage. However, coverage for any injury, damage or medical expenses described in any of the provisions of this endorsement may be excluded or limited by another endorsement to the Coverage Part, and these coverage broadening provisions do not apply to the extent that coverage is excluded or limited by such an endorsement. The following listing is a general coverage description only. Limitations and exclusions may apply to these coverages. Read all the provisions of this endorsement and the rest of your policy carefully to determine rights, duties, and what is and is not covered.

A. BROAD FORM NAMED INSURED
B. BLANKET ADDITIONAL INSURED
C. EMPLOYEE HIRED AUTO
D. EMPLOYEES AS INSURED
E. SUPPLEMENTARY PAYMENTS — INCREASED LIMITS
F. HIRED AUTO — LIMITED WORLDWIDE COVERAGE — INDEMNITY BASIS
G. WAIVER OF DEDUCTIBLE — GLASS
H. HIRED AUTO PHYSICAL DAMAGE — LOSS OF USE — INCREASED LIMIT
I. PHYSICAL DAMAGE — TRANSPORTATION EXPENSES — INCREASED LIMIT
J. PERSONAL PROPERTY
K. AIRBAGS
L. NOTICE AND KNOWLEDGE OF ACCIDENT OR LOSS
M. BLANKET WAIVER OF SUBROGATION
N. UNINTENTIONAL ERRORS OR OMISSIONS

PROVISIONS

A. BROAD FORM NAMED INSURED

The following is added to Paragraph A.1., Who Is An Insured, of SECTION II — COVERED AUTOS LIABILITY COVERAGE:

Any organization you newly acquire or form during the policy period over which you maintain 50% or more ownership interest and that is not separately insured for Business Auto Coverage. Coverage under this provision is afforded only until the 180th day after you acquire or form the organization or the end of the policy period, whichever is earlier.

B. BLANKET ADDITIONAL INSURED

The following is added to Paragraph c. in A.1., Who Is An Insured, of SECTION II — COVERED AUTOS LIABILITY COVERAGE:

Any person or organization who is required under a written contract or agreement between you and that person or organization, that is signed and executed by you before the "bodily injury" or "property damage" occurs and that is in effect during the policy period, to be named as an additional insured is an "insured" for Covered Autos Liability Coverage, but only for damages to which this insurance applies and only to the extent that person or organization qualifies as an "insured" under the Who Is An Insured provision contained in Section II.

C. EMPLOYEE HIRED AUTO

1. The following is added to Paragraph A.1., Who Is An Insured, of SECTION II — COVERED AUTOS LIABILITY COVERAGE:

An "employee" of yours is an "insured" while operating an "auto" hired or rented under a contract or agreement in an "employee's" name, with your permission, while performing duties related to the conduct of your business.

2. The following replaces Paragraph b. in B.5., Other Insurance, of SECTION IV — BUSINESS AUTO CONDITIONS:

b. For Hired Auto Physical Damage Coverage, the following are deemed to be covered "autos" you own:

(1) Any covered "auto" you lease, hire, rent or borrow; and

(2) Any covered "auto" hired or rented by your "employee" under a contract in an "employee's" name, with your
permission, while performing duties related to the conduct of your business. However, any "auto" that is leased, hired, rented or borrowed with a driver is not a covered "auto".

D. EMPLOYEES AS INSURED

The following is added to Paragraph A.1., Who Is An Insured, of SECTION II - COVERED AUTOS LIABILITY COVERAGE:

Any "employee" of yours is an "insured" while using a covered "auto" you don't own, hire or borrow in your business or your personal affairs.

E. SUPPLEMENTARY PAYMENTS - INCREASED LIMITS

1. The following replaces Paragraph A.2.a.(2), of SECTION II - COVERED AUTOS LIABILITY COVERAGE:

(2) Up to $3,000 for cost of bail bonds (including bonds for related traffic law violations) required because of an "accident" we cover. We do not have to furnish these bonds.

2. The following replaces Paragraph A.2.a.(4), of SECTION II - COVERED AUTOS LIABILITY COVERAGE:

(4) All reasonable expenses incurred by the "insured" at our request, including actual loss of earnings up to $500 a day because of time off from work.

F. HIRED AUTO - LIMITED WORLDWIDE COVERAGE - INDEMNITY BASIS

The following replaces Subparagraph (5) in Paragraph B.7., Policy Period, Coverage Territory, of SECTION IV - BUSINESS AUTO CONDITIONS:

(5) Anywhere in the world, except any country or jurisdiction while any trade sanction, embargo, or similar regulation imposed by the United States of America applies to and prohibits the transaction of business with or within such country or jurisdiction, for Covered Autos Liability Coverage for any covered "auto" that you lease, hire, rent or borrow without a driver for a period of 30 days or less and that is not an "auto" you lease, hire, rent or borrow from any of your "employees", partners (if you are a partnership), members (if you are a limited liability company) or members of their households.

(a) With respect to any claim made or "suit" brought outside the United States of America, the territories and possessions of the United States of America, Puerto Rico and Canada:

(i) You must arrange to defend the "insured" against, and investigate or settle any such claim or "suit" and keep us advised of all proceedings and actions.

(ii) Neither you nor any other involved "insured" will make any settlement without our consent.

(iii) We may, at our discretion, participate in defending the "insured" against, or in the settlement of, any claim or "suit".

(iv) We will reimburse the "insured" for sums that the "insured" legally must pay as damages because of "bodily injury" or "property damage" to which this insurance applies, that the "insured" pays with our consent, but only up to the limit described in Paragraph C., Limits Of Insurance, of SECTION II - COVERED AUTOS LIABILITY COVERAGE.

(v) We will reimburse the "insured" for the reasonable expenses incurred with our consent for your investigation of such claims and your defense of the "insured" against any such "suit", but only up to and included within the limit described in Paragraph C., Limits Of Insurance, of SECTION II - COVERED AUTOS LIABILITY COVERAGE, and not in addition to such limit. Our duty to make such payments ends when we have used up the applicable limit of insurance in payments for damages, settlements or defense expenses.

(b) This insurance is excess over any valid and collectible other insurance available to the "insured" whether primary, excess, contingent or on any other basis.

(c) This insurance is not a substitute for required or compulsory insurance in any country outside the United States, its territories and possessions, Puerto Rico and Canada.
You agree to maintain all required or compulsory insurance in any such country up to the minimum limits required by local law. Your failure to comply with compulsory insurance requirements will not invalidate the coverage afforded by this policy, but we will only be liable to the same extent we would have been liable had you complied with the compulsory insurance requirements.

(d) It is understood that we are not an admitted or authorized insurer outside the United States of America, its territories and possessions, Puerto Rico and Canada. We assume no responsibility for the furnishing of certificates of insurance, or for compliance in any way with the laws of other countries relating to insurance.

G. WAIVER OF DEDUCTIBLE - GLASS
The following is added to Paragraph D., Deductible, of SECTION III - PHYSICAL DAMAGE COVERAGE:

No deductible for a covered "auto" will apply to glass damage if the glass is repaired rather than replaced.

H. HIRED AUTO PHYSICAL DAMAGE - LOSS OF USE - INCREASED LIMIT
The following replaces the last sentence of Paragraph A.4.b., Loss Of Use Expenses, of SECTION III - PHYSICAL DAMAGE COVERAGE:

However, the most we will pay for any expenses for loss of use is $65 per day, to a maximum of $750 for any one "accident".

I. PHYSICAL DAMAGE - TRANSPORTATION EXPENSES - INCREASED LIMIT
The following replaces the first sentence in Paragraph A.4.a., Transportation Expenses, of SECTION III - PHYSICAL DAMAGE COVERAGE:

We will pay up to $50 per day to a maximum of $1,500 for temporary transportation expense incurred by you because of the total theft of a covered "auto" of the private passenger type.

J. PERSONAL PROPERTY
The following is added to Paragraph A.4., Coverage Extensions, of SECTION III - PHYSICAL DAMAGE COVERAGE:

Personal Property
We will pay up to $400 for "loss" to wearing apparel and other personal property which is:

(1) Owned by an "insured"; and (2) In or on your covered "auto".

This coverage applies only in the event of a total theft of your covered "auto".

No deductibles apply to this Personal Property coverage.

K. AIRBAGS
The following is added to Paragraph B.3., Exclusions, of SECTION III - PHYSICAL DAMAGE COVERAGE:

Exclusion 3.a. does not apply to "loss" to one or more airbags in a covered "auto" you own that inflate due to a cause other than a cause of "loss" set forth in Paragraphs A.1.b. and A.1.c., but only:

a. If that "auto" is a covered "auto" for Comprehensive Coverage under this policy;
b. The airbags are not covered under any warranty; and
c. The airbags were not intentionally inflated.

We will pay up to a maximum of $1,000 for any one "loss".

L. NOTICE AND KNOWLEDGE OF ACCIDENT OR LOSS
The following is added to Paragraph A.2.a., of SECTION IV - BUSINESS AUTO CONDITIONS:

(a) You (if you are an individual);
(b) A partner (if you are a partnership);
(c) A member (if you are a limited liability company);
(d) An executive officer, director or insurance manager (if you are a corporation or other organization); or
(e) Any "employee" authorized by you to give notice of the "accident" or "loss".

M. BLANKET WAIVER OF SUBROGATION
The following replaces Paragraph A.5., Transfer Of Rights Of Recovery Against Others To Us, of SECTION IV - BUSINESS AUTO CONDITIONS:

We waive any right of recovery we may have against any person or organization to the extent required of you by a written contract signed and executed prior to any "accident" or "loss", provided that the "accident" or "loss" arises out of operations contemplated by
such contract. The waiver applies only to the person or organization designated in such contract.

N. UNINTENTIONAL ERRORS OR OMISSIONS

The following is added to Paragraph B.2., Concealment, Misrepresentation, Or Fraud, of SECTION IV – BUSINESS AUTO CONDITIONS:

The unintentional omission of, or unintentional error in, any information given by you shall not prejudice your rights under this insurance. However this provision does not affect our right to collect additional premium or exercise our right of cancellation or non-renewal.
WAIVER OF OUR RIGHT TO RECOVER FROM OTHERS ENDORSEMENT

We have the right to recover our payments from anyone liable for an injury covered by this policy. We will not enforce our right against the person or organization named in the Schedule. (This agreement applies only to the extent that you perform work under a written contract that requires you to obtain this agreement from us.)

This agreement shall not operate directly or indirectly to benefit any one not named in the Schedule.

SCHEDULE

DESIGNATED PERSON:

Any person or organization for which the named insured has agreed by written contract executed prior to loss to furnish this waiver

DESIGNATED ORGANIZATION:
EVIDENCE OF PROPERTY INSURANCE

THIS EVIDENCE OF PROPERTY INSURANCE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFRS NO RIGHTS UPON THE ADDITIONAL INTEREST NAMED BELOW. THIS EVIDENCE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS EVIDENCE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE ADDITIONAL INTEREST.

AGENCY
Wells Fargo Insurance Services USA, Inc.
400 Hwy 169 South
8th Floor
St. Louis Park, MN 55426
Scott Gronholz

PHONE: 1-952-242-3100

EMAIL ADDRESS:

CODE: SUB CODE:

AGENCY CUSTOMER ID #:

INSURED
Daktronics, Inc.
301 Daktronics Drive
PO Box 5128
Brookings, SD 57006-5128

PROPERTY INFORMATION

LOCATION/DESCRIPTION
Territory - Worldwide except any country or jurisdiction which is the subject to economic or trade embargoes imposed by the laws or regulations of the United States of America.

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS EVIDENCE OF PROPERTY INSURANCE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

COVERAGE INFORMATION

<table>
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<tr>
<th>COVERAGE / PERILS / FORMS</th>
<th>AMOUNT OF INSURANCE</th>
<th>DEDUCTIBLE</th>
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<tr>
<td>Installation Floater</td>
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<td>100,000</td>
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<tr>
<td>- Special Causes of Loss, Including Theft</td>
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<td>- Blanket Waiver of Subrogation, prior to loss per written contract or agreement</td>
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<tr>
<td>- Loss Payee as endorsed to policy</td>
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REMARKS (Including Special Conditions)

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

ADDITIONAL INTEREST

NAME AND ADDRESS
Evidence of Coverage
For bidding purposes only

MORTGAGEE
ADDITIONAL INSURED
LOSS PAYEE
LOAN #
AUTHORIZED REPRESENTATIVE

ACORD 27 (2009/12) © 1993-2009 ACORD CORPORATION. All rights reserved.
48447185
The ACORD name and logo are registered marks of ACORD
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;
- 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 ______________________________, 20__.

( Name of General Bidder)

By ________________________________

( Print Name/Title of Person Signing Bid)

______________________________

(Signature)

______________________________

(Business Address)

______________________________

(City and State)

______________________________  __________________________

(Telephone Number)  (Facsimile Number)

55
The following information is furnished by the Bidder for the information of the University of Massachusetts Amherst.

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.

University of Massachusetts Amherst
Facilities Planning
Physical Plant Building
360 Campus Center Way
Amherst, MA 01003-9248
Telephone: (413) 545-1383
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

(name of architect or engineer)

__________________________

(project number) (project name)

in ____________________________, Massachusetts, for the Contract sum of ____________________________ 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-bidded ____________________________
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:

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<th>NAME</th>
<th>CLASS OF WORK</th>
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(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.

<table>
<thead>
<tr>
<th>Building</th>
<th>Designer</th>
<th>General Contractor</th>
<th>Amount of Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
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<td>(b)</td>
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<tr>
<td>(c)</td>
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</tbody>
</table>

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 word “person” shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.
The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Date: ____________________________

_________________________________
(Name of Sub-Bidder)

By: ____________________________

_________________________________
(Title and Name of Person Signing Bid)

_________________________________
(Business Address)

_________________________________
(Business Telephone No.)
BID PACKAGE

PART II

OWNER - CONTRACTOR AGREEMENT

Owner - Contractor Agreement

Exhibit A: Additional Insurance Requirements, if any.

Exhibit B: Forms Used During Contract Award and Execution:
  Payment Bond
  Performance Bond
  Schedule for Participation by Minority/Women Business
  Enterprises
  Letter of Intent
  Certificate of Corporate Vote
  Certificate of Joint Venture
  Certificate of Compliance with State Tax Laws
  Form of Subcontract

Document ID: ____________________________
Contractor's DCAM Certification Number: ___ - ___
Contractor's Vendor Code Number: ____________________________

63
Awarding Authority: University of Massachusetts Amherst

Department Code: ___ ___ ___

This agreement ("Contract") is made of _____________ 2016 by and between the Commonwealth of Massachusetts acting by and through the Awarding Authority identified above with a principal place of business at The University of Massachusetts Amherst, 140 Hicks Way, Room 407 Goodell,

and Five Star Building Corp., a _________________ with a principal place of business at 123 UNION ST, EASTHAMPTON, MA, 01027 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 Mullins Center and Garber Field, Videoboards

UMA Number: UMA17-06,

Project Number 1008489 in accordance with and as described in the Plans and Specifications dated October 7, 2016, prepared by Gensler ("Designer"), as modified by Addenda Nos. 1 and 2

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, by June 23, 2017, 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 30 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 Two Million Three Hundred Seventy Six Thousand Six Hundred Dollars ($2,376,600.00) dollars. 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): 1 and 2

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.49A, 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 from 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, including Exhibit A, if any.
- 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 combined participation goal for Minority/Women Business Enterprise for this Contract is **10.4** %.  

The MBE/WBE participation goal must include a reasonable representation of both MBE and WBE firms that meet or exceeds the combined goal. MBE/WBE participation plans that consist solely of either a MBE or WBE representing 100% of the overall combined goals will not be considered reasonable or responsive. Firms submitting MBE/WBE participation plans which do not provide reasonable participation by both MBE/WBE firms shall be provided an opportunity to revise and resubmit their plans within the time frame set by the awarding authority; however, no price adjustments shall be permitted as a result of the revised plan. Firms failing to submit an MBE/WBE participation plan deemed reasonable, and accepted by the awarding authority, shall not be awarded the contract.

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: N/A

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: Kevin Perrier

Title: President

Date: 12/28/16

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 University of Massachusetts Amherst and further certifies under the penalties of perjury that all the applicable provisions of M.G.L. c. 149, s. 44J, have been complied with.

Application of Executive Orders: This agreement is funded by state appropriation; and, accordingly, the University of Massachusetts is using the State Standard Contract terms and conditions for the purposes of this agreement. Chapter 75 of the Massachusetts General Laws, empowers the Board of Trustees of the University of Massachusetts with the authority to govern and manage its affairs without supervision or subject to the control of any other entity of the Commonwealth unless specifically set forth in the Massachusetts General Laws. Therefore the provisions of the State Executive Orders included in this agreement are not applicable to the University of Massachusetts.

All Contracts

Signature: Andrew P. Mangels

By: Email: amangels@admin.umass.edu

Name: 

Title: Vice Chancellor for Administration & Finance

Date: 

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CONTRACTOR:

By: [Signature]

Name: Kevin Perrier

Title: President

Date: 12/28/16

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 University of Massachusetts Amherst and further certifies under the penalties of perjury that all the applicable provisions of M.G.L. c. 149, s. 44J, have been complied with.

Application of Executive Orders: This agreement is funded by state appropriation; and, accordingly, the University of Massachusetts is using the State Standard Contract terms and conditions for the purposes of this agreement. Chapter 75 of the Massachusetts General Laws, empowers the Board of Trustees of the University of Massachusetts with the authority to govern and manage its affairs without supervision or subject to the control of any other entity of the Commonwealth unless specifically set forth in the Massachusetts General Laws. Therefore the provisions of the State Executive Orders included in this agreement are not applicable to the University of Massachusetts.

All Contracts

By: [Signature]

Name: [Name]

Title: Vice Chancellor for Administration & Finance

Date: [Date]
EXHIBIT A
Additional Insurance Provisions

(Insert provision specifying deductible amounts if any)
Exhibit B

Forms Used During Contract Award and Execution

Payment Bond
Performance Bond
Certificate of Corporate Vote
Certificate of Joint Venture
Certificate of Compliance with State Tax Laws
Form for Subcontract
PAYMENT BOND

Know all men by these presents, that

as principal, and Travelers Casualty & Surety Company of America

as surety, are held and firmly bound unto the University of Massachusetts Amherst in the sum of

Two Mill Three Hund. Seventy Six Thous. Six Hund. ($2,376,600.00)

in lawful money of the United States of America, to be paid to the University of Massachusetts Amherst, 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 University of Massachusetts Amherst ("Awarding Authority")

Bearing date of December 29, 2016, for construction of

UMA Number 17-06

Project Name Mullins Center & Garber Field, Videoboards

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 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 section29, 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

December 29, 2016

Five Star Building Corp. (Seal)
(Print Name of General Contractor)

Travelers Casualty & Surety Co of America (Seal)
(Print Name of Surety)

By
(Signature – Title)

Surety Address One Tower Square

Hartford, CT

70
PERFORMANCE BOND

Know all men by these presents, that

as principal, and Travelers Casualty & Surety Company of America

as surety, are held and firmly bound unto the University of Massachusetts Amherst in the sum of

Two Mill Three Hund. Seventy Six Thous. Six Hund. ($2,376,600.00)

in lawful money of the United States of America, to be paid to the University of Massachusetts Amherst, 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 University of Massachusetts Amherst ("Awarding Authority")

bearing date of December 29, 2016, for construction of

UMA Number 17-06

Project Name Mullins Center & Garber Field, Videoboards

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 University of Massachusetts Amherst, 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 University of Massachusetts Amherst under the provisions of said Contract, said surety shall, if requested in writing by the University of Massachusetts Amherst, take such action is necessary to complete the Contract.

In witness whereof we hereunto set our hand and seals this 29 day of

Dec., 2016
Casualty & Surety America

(Print Name of General Contractor) (Print Name of Surety)

By

(Signature – Title)

(Signature – Title)

Surety Address: One Tower Square

Hartford, CT

Countersigned Mass. Resident Agent By: Webber & Grinnell Insurance Agency Inc

Agent's Address: 8 North King Street, Northampton, MA 01060

Telephone Number: 413.586.0111
KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Mathew Geffin, Richard Webber, William Grinnell, Nancy Horan, and Jenna Rodrigue

of the City of Northampton, State of Massachusetts, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereeto affixed, this 26th day of September, 2016.

By:

Robert L. Raney, Senior Vice President

On this the 26th day of September, 2016, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.

By Commission expires the 30th day of June, 2021.

Marie C. Tetreault, Notary Public

58440-5-16 Printed in U.S.A.
This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or undertaking to which it is attached.

I, Kevin E. Hughes, the undersigned, Assistant Secretary, of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Company, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this day of 20.

Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, call 1-800-421-3880 or contact us at www.travelersbond.com. Please refer to the Attorney-In-Fact number, the above-named individuals and the details of the bond to which the power is attached.
**CERTIFICATE OF LIABILITY INSURANCE**

**DATE (MM/DD/YYYY):** 12/28/2016

**THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFER NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.**

**IMPORT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).**

**PRODUCER:**

Webber & Grinnell  
8 North King Street  
Northampton MA 01060

**CONTACT NAME:** Jenna Rodrigue, CISR  
**PHONE:** (413) 586-0111  
**FAX:** (413) 586-6481  
**E-MAIL ADDRESS:** jrodrigue@webberandgrinnell.com

**INSURER(S) AFFORDING COVERAGE / NAIC #:**

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<tr>
<th>INSURER(S)</th>
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<tbody>
<tr>
<td>A: General Casualty/WI</td>
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<tr>
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<td>C:</td>
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<td>D:</td>
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<td>F:</td>
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</table>

**INSURED:**

Five Star Building Corp  
Attn: Kevin Perrier  
123 Union Street, Ste #200  
Easthampton MA 01027

**INSURER(S) AFFORDING COVERAGE / NAIC #:**

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<tr>
<th>INSURER(S)</th>
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**COVERAGES / CERTIFICATE NUMBER: Master 2017 / REVISION NUMBER:**

**THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.**

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<th>POLICY EXP (MM/DD/YYYY)</th>
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<td>E.L. DISEASE - POLICY LIMIT $1,000,000</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>Contractor's Pollution Liability - Occurrence</td>
<td></td>
<td>16CPLONE60333</td>
<td>3/1/2016</td>
<td>3/1/2017</td>
<td>Limit: $1,000,000</td>
</tr>
</tbody>
</table>

**DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)**

Proof of Coverage RE: UMA 17-06 Mullins Center & Garber Field, Videoboards

**CERTIFICATE HOLDER:**

University of Massachusetts  
140 Hicks Way  
Amherst, MA 01003

**CANCELLATION:**

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

**AUTHORIZED REPRESENTATIVE:**

J Rodrigue, CISR/JER

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ACORD 25 (2014/01)  
INS025 (201401)
SCHEDULE FOR PARTICIPATION
BY MINORITY/WOMEN BUSINESS ENTERPRISES
UNIVERSITY OF MASSACHUSETTS AMHERST

UMA Number 17-06  Project Location Amherst Massachusetts

Project Name Mullins Center Score boards

This form must be submitted by the General Contractor within five (5) working days of the opening of the General Bids. A Letter of Intent and SOMWBA certification letter for each M/WBE must be submitted with this Schedule of M/WBE participation.

BIDDER CERTIFICATION:
The undersigned General Contractor firm agrees that it will subcontract with the following listed firms for the work described and for the dollar amounts listed below. 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. The General Contractor must indicate the MBE/WBE firms it intends to utilize on the project as follows (attach additional sheets if necessary):

<table>
<thead>
<tr>
<th>Company Name &amp; Address</th>
<th>MBE or WBE</th>
<th>Describe MBE/WBE Scopes of Work</th>
<th>Total Dollar Value of Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Infinity Abatement - Lawrence</td>
<td>MBE</td>
<td>Demolition</td>
<td>$77,000</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3.</td>
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<td>7.</td>
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<tr>
<td>8.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

73
MBE Goal: $ Combined $64,168.00  
Total Dollar Value of MBE Commitment: $77,000.00

WBE Goal: $ (See Above)  
Total Dollar Value of WBE Commitment: $0.00

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 General Contractor to the commitment set forth above.

Name of General Contractor: Five Star Building Corp

Business Address: 123 Union Street, Easthampton, MA

Name (print): Kevin Perrier

Title: President

Authorized Signature: [Signature]

Telephone No.: 413-527-4060  
Fax No.: 413-527-4061

Date: January 3, 2017
LETTER OF INTENT
MINORITY/WOMEN BUSINESS ENTERPRISES PARTICIPATION
UNIVERSITY OF MASSACHUSETTS AMHERST

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

UMA Number: 17-06
Indicate SOMWBA Certification:

Project Name: Mullins Center and Garber Field Videoboards
Project Location: UMass Amherst, Massachusetts

To: Five Star Building Corp

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

<table>
<thead>
<tr>
<th>Section/Item Number (if applicable)</th>
<th>Describe MBE/WBE Scopes of Work (clarify &quot;Labor Only&quot;, &quot;Material Only&quot; or &quot;Labor and Material&quot;)</th>
<th>If Supplier, Indicate Total Value of Supplies (10% of total counts toward Participation)</th>
<th>Dollar Value of Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Labor, Equipment, Materials, vehicles needed to remove and dispose of items for demolition</td>
<td></td>
<td>$77,000.00</td>
</tr>
</tbody>
</table>

**Total Dollar Value:**

$77,000.00

**Name of MBE/WBE Firm:** Infinity

**Authorized Signature:** [Signature]

**Business Address:** 91 Farm St, Lawrence, MA 01843

**Print Name:** Micelle Fabrice

**Title:** President

**Telephone No.:** 978-499-8984

**Fax No.:** 1-5-17

Letter of Intent - Revised 10/01
CERTIFICATE OF CORPORATE VOTE

December 28, 2016

I hereby certify that I am the clerk, assistant clerk, of Five Star Building Corp (the "Corporation") and that at a duly authorized meeting of the Board of Directors of the Corporation held on January 11, 2008 in Easthampton, MA a quorum was present and voting it was voted to authorize Kevin Perrier President of the Corporation to execute 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:

UMA Number UMA 17-06

Project Title: Mullins Center & Garber Field, Videoboards

I further certify that Kevin Perrier President of the Corporation and that said vote has not been repealed, rescinded or amended.

Kevin Perrier Name

12/28/16 Date

(CORPORATE SEAL)

SUBSCRIBED AND SWORN TO THIS 29 DAY OF December 2016 BEFORE ME

Notary Public

My Commission Expires: 1-4-19
CERTIFICATE OF JOINT VENTURE
(INCLUDING SIGNATURE AUTHORITY)

This certificate is being given in connection with the execution by

N/A (the “Joint Venture”) of the following construction contract with

the University of Massachusetts Amherst:

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 Director of Facilities Planning, University of
Massachusetts Amherst and only by a written document executed by the members of the
Management Committee.
CERTIFICATE OF COMPLIANCE WITH STATE LAWS AND WITH UNEMPLOYMENT COMPENSATION
CONTRIBUTION REQUIREMENTS

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

I, Kevin Perrier, authorized signatory for Five Star Building Corp, whose principal place of business is at 123 Union Street, Suite 200, Easthampton, MA 01027,

do hereby certify under penalties of perjury that Five Star Building Corp 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 26-1755587.

Signed under the penalties of perjury the 28th day of December, 2016.

Signature: [Signature]

Name: Kevin Perrier

Title: President
CERTIFICATE OF COMPLIANCE WITH EMPLOYMENT ELIGIBILITY VERIFICATION REQUIREMENTS (I-9 CERTIFICATE)

Applicable to all UMA Construction Projects
To Be Executed by GC/CMGC/All Subcontractors

Company Name: Five Star Building Corp

I, Kevin Perrier, authorized signatory for (Print Name)

Company whose principal place of business is at
123 Union Street, Suite 200, Easthampton, MA 01027

(Address)

do hereby certify under penalties of perjury that Company shall comply with Federal Department of Homeland Security Requirements in hiring any and all “Employees” to be employed in the Project who are required to be listed in the certified payroll reports for the Project. Such compliance shall include, but not be limited to the faithful completion of the Federal Department of Homeland Security Form I-9 process by company for each of its Employees. Company shall require each of its subcontractors to execute and provide to Company a Certificate of Compliance with Employment Eligibility Verification Requirements (I-9 Certificate) with the execution of each subcontract, and Company shall forward a copy of each such I-9 Certificate to the General Contractor for filing with the University of Massachusetts Amherst. In addition, Company is aware that the weekly workforce report form contained in the contract documents, which must be submitted by the Company on a weekly basis, contains a statement that the Form I-9 process was faithfully completed for all employees listed on the weekly certified payroll report. Company therefore acknowledges that the Company and all of its subcontractors will be required to certify that the Form I-9 process was faithfully completed for all Employees listed on each certified payroll report when submitted.

By the signature of the Contractor’s Authorized Signatory below, the contractor certifies under the pains and penalties of perjury that the Contractor shall not knowingly use undocumented workers in connection with the performance of this contract; that pursuant to federal requirements, the Contractor shall verify the immigration status of all workers assigned to the contract without engaging in unlawful discrimination; and that the Contractor shall not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker. The Contractor understands and agrees that breach of any of these terms during the period of a contract may be regarded as a material breach, subjecting the Contractor to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination.

UMA Project Number: 17-06 Project Number: 1008489
Project Title: Mullins Center & Garber Field, Videoboards

The Company Social Security No. or Federal Identification No. is: 26-1755587

Signed under pains and penalties of perjury the 28 day of DEC, 2016

Signature: __________________________

Name and Title: Kevin Perrier, President

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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 law of ____________________________

a partnership consisting of _________________________________________________

an individual doing business as _____________________________________________

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

(Name of Architect 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 called the “Awarding (Awarding Authority)

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 with a reasonable time after the execution of this subcontract, evidence of workers’ 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)
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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  Daily Time and Material Report for Change Orders
  Notice of Intent
  Request and Agreement for a Change in the Plans, Specifications and/or Contract (UMA Form 5)
  Instructions Regarding Change Orders and Contract Modifications (DCAM Form 13)
  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
  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, UMA Form 16)
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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 (DCAM Form 5)
Notice of Intent
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
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, DCAM 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.

**Days:** Represents calendar days, excluding weekend and holidays, unless otherwise specified.

**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.

Gensler / Richard Curtiss (617) 619-5873

**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 and 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 University of Massachusetts Amherst, or other instrumentality that will own the Work, including but not limited to the following: UMBA and the Commonwealth.

**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.

Joe Balzano 413-835-5440

**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 and Specifications – the most stringent shall apply

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 therefore. 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:

   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 material men 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 therefore.
   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.


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.**
Except as otherwise specified in the Supplementary General Conditions or Specifications, 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. **Contract Documents and Samples at the Site.**
A reasonable number of sets of Contract Documents, as defined by the Awarding Authority, 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.

12. **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.
13. 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) Include the terms of this Section 14 in every subcontract so that such terms will be binding on each subcontractor.
   (3) 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 calling 811 or online at http://www.digsafe.com.

(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.


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.
15. **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 set forth in the Supplementary General Conditions or the Specifications.

16. **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.

17. **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.

18. **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 under the University of Massachusetts Amherst Form ST-5C Contractor’s Sales Tax Exemption, Purchase Certificate, E 043-167-352. 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. A copy of the Form ST-5C is provided with this contract.

19. 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.

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.
21. **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.

22. **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.

23. **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 silver standard or a higher LEED standard applies to all projects overseen by the University of Massachusetts Amherst, 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 six (6) 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 therefore, 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, DCAM 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, detailed and computer generated 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 therefore 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 a 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.

G. During the period when the Awarding Authority is assessing any cost associated with the failure to meet the substantial completion end date, the University of Massachusetts Amherst may create a Unilateral Change Order for an extension of dates to allow for any contractual obligations it has in association with this UMA project. This Unilateral Change Order should not in any way be construed by the contractor to be an extension to the actual contract substantial completion date.

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.

   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) have a state building official 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.


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 incompletions 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 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 within 10 days, thereafter.

   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 such 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.


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 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);

(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.

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.

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 sub-paragraphs (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 DCAM Daily Time and Materials Report found in DCAM 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.


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. 7, s. 42E-42I. 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. 7, s. 39A for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section 39A:

"(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute."
"(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefore, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his/her designee shall be final and conclusive unless an appeal is taken as provided below.

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

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

5. Mandatory Mediation.
In the case of every dispute where the dollar amount in dispute (or the estimated dollar value of the extension of time in dispute) is $50,000 or more and the 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 therefore, 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 therefore, 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 therefore 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 for the preceding months, 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, 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 rediscout rate than 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 period 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 commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and, water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor’s certification within the twenty-one day period, the contractor’s certification shall take effect as the awarding authority’s declaration that the work has been substantially completed.

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 on that work, including quantity, price and all but one percent retainage for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payments filed by subcontractors and not yet paid to subcontractors or deposit 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 then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

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 or 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 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. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its 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 to 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 Warranties.
   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 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. Employment Eligibility Verification. The Contractor shall comply with Federal Department of Homeland Security Requirements in hiring any and all “Employees” to be employed in the Project who are required to be listed in the certified payroll reports for the Project. Such compliance shall include, but not be limited to the faithful completion of the Federal Department of Homeland Security Form I-9 process by the Contractor for each of its Employees. The Contractor shall execute a Certificate of Compliance with Employment Eligibility Verification Requirements (I-9 Certificate) with the execution of its Contract. The Contractor shall require each of its subcontractors and sub subcontractors to execute and provide to Contractor an I-9 Certificate with the execution of each subcontract, and Contractor shall immediately provide a copy to Awarding Authority. Contractor acknowledges that the weekly workforce report form contained in the contract documents, which must be submitted by the Contractor on a weekly basis, contains a statement that the Form I-9 process was faithfully completed for all employees listed on the weekly certified payroll report. By the signature of the Contractor’s Authorized Signatory on the I-9 Certificate, the Contractor certifies under the pains and penalties of perjury that the Contractor shall not knowingly use undocumented workers in connection with the performance of this contract; that pursuant to federal requirements, the Contractor shall verify the immigration status of all workers assigned to the contract without engaging in unlawful discrimination; and that the Contractor shall not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker. The Contractor understands and agrees that breach of any of these terms during the period of a contract may be regarded as a material breach, subjecting the Contractor to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination.

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

C. Prevailing Wages. The Contractor shall comply with M.G.L. c. 149, s. 26-7H. 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. 27 yearly review of wage rates. 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).

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, inclusive of fuel charges for use of common or contract motor carrier and trucks owned 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 nor 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

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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, DCAM, 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 therefore, 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.

   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 DCAM 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 DCAM 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 ANDAFFIRMATIVE
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 take out and maintain the insurance coverage 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 authorized to
      write that type of insurance under the laws of the Commonwealth and rated in Best's Insurance Guide
      (or any successor thereto or replacement thereof) as having a general policy holder rating of "A" or
      better and a financial rating of at least "9" or otherwise acceptable to the 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 the
      Awarding Authority and the Owner as an additional insured as to all policies of liability insurance and
      shall state that Contractor has paid all premiums and that none of the coverage shall be cancelled,
      terminated, or materially modified unless and until 30 days prior notice is given in writing to the
      Awarding Authority. The awarding authority is the University of Massachusetts, and the owner is the
      University of Massachusetts Amherst or other instrumentality that will own the work including but
      not limited to the following: UMBA and the Commonwealth. 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. Certificates shall
      indicate that the contractual liability coverage, and Contractor's Protective Liability coverage is in
      force. Certificates shall include specific acknowledgment that the following coverage are included in
      the policies:
      - Contractual liability
      - Contractor's protective
      - Owner as additional insured by form CG2010 (11/85 ed.) to the general liability
      - Owner as additional insured to automobile liability, umbrella liability, and
        pollution liability
      - General Liability is endorsed with CG2404, Waiver of Subrogation, in favor of the
        Owner
— Builder’s Risk or Installation Floater includes Owner, Contractor and subcontractors of any tier as named insured. Builder’s Risk or Installation floater is on an All Risk basis including earthquake and flood.

D. The Contractor shall file one certified copy of all policies with the Awarding Authority within sixty days after Contract award. If the Awarding Authority or the Owner 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 Owner attributable thereto.

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

2. Contractor’s Commercial General Liability.

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

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodily Injury &amp;</td>
<td>$1,000,000 each occurrence</td>
</tr>
<tr>
<td>Property Damage</td>
<td>$2,000,000 general aggregate, per project</td>
</tr>
<tr>
<td>Products &amp; Completed Operations</td>
<td>$1,000,000 annual aggregate</td>
</tr>
<tr>
<td>Personal &amp; Advertising Injury</td>
<td>$1,000,000 each occurrence</td>
</tr>
<tr>
<td>Medical Expenses</td>
<td>$10,000</td>
</tr>
</tbody>
</table>

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

C. This policy shall include contractual liability coverage.

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

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

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


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

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined Single Limit</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

B. The policy shall include a CA9948 Pollution Endorsement and shall name the Owner as an Additional Insured.
4. **Pollution Liability.**
The Contractor shall provide coverage for bodily injury and property damage resulting from liability arising out of pollution related exposures such as asbestos abatement, lead paint abatement, tank removal, removal of contaminated soil, etc. The Awarding Authority and the Owner shall be named as an additional insured and coverage must be on an occurrence basis. The amount of coverage shall be $1,000,000 per occurrence and $3,000,000 in the aggregate unless a higher amount is specified in Exhibit A to the Owner - Contractor Agreement, in which case the Contractor shall provide the additional coverage.

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 B to the Owner - Contractor Agreement, in which case the Contractor shall provide the higher coverage:
   - **Worker's Compensation**
     - Provide Statutory Minimum
   - **Part One**
     - $ 500,000 each accident
   - **Employer's Liability**
     - $ 500,000 disease per employee
   - **Part Two**
     - $ 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), Maritime Liability for $1,000,000/$1,000,000, or Federal Employer's Liability Act liability.

6. **Builder's Risk/ Installation Floater/Stored Materials.**
   A. The Contractor shall provide 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, collapse, earthquake, flood (if the project is not in an "A" or a "V" flood Zone), windstorm, false work, 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. This policy and/or installation floater shall indicate if Stored Materials coverage is provided as required below.
   B. When Work will be completed on existing buildings owned by the Owner, the 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, false work, 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. This policy and/or installation floater shall indicate if Stored Materials coverage is provided as required 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 some approved 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, 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, Owner, the Contractor, and Subcontractors of any tier as named insured.

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

F. Coverage shall include temporary occupancy and waiver of subrogation and shall waive all rights of recovery by subrogation against the University of Massachusetts Building Authority, the University, and the Commonwealth of Massachusetts.

7. **Umbrella Coverage.**

The Contractor shall provide Umbrella Coverage in form at least as broad as primary coverage 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:

<table>
<thead>
<tr>
<th>Contract Price:</th>
<th>Umbrella Coverage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under $1,000,000</td>
<td>$2,000,000</td>
</tr>
<tr>
<td>$1,000,001 -- $5,000,000</td>
<td>$5,000,000</td>
</tr>
<tr>
<td>$5,000,001 -- $10,000,000</td>
<td>$10,000,000</td>
</tr>
<tr>
<td>$10,000,001 and over</td>
<td>$25,000,000</td>
</tr>
</tbody>
</table>

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.

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 money then due or to become due to 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 its obligations under this Agreement for any fiscal year during the term of this Agreement, the Awarding Authority shall not be obligated to make any further payments, and this Agreement
may be terminated immediately by either the Awarding Authority or the Contractor, provided that the Awarding Authority 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 Awarding Authority and/or 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.
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 the University of Massachusetts Amherst 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:

   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.

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


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, as approved by the Awarding Authority, 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 impose them again.

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 the University of Massachusetts Amherst is the Awarding Authority.

GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES (EXECUTIVE ORDER 390, M.G.L. c. 7, s. 40N)

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 M/WBE participation set forth in the Owner - Contractor Agreement in order to meet the M/WBE participation goals established for this Contract.

2. M/WBE Participation Credit.
   A. If the Contractor is itself an MBE or WBE, M/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 M/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 M/WBE joint ventures’, M/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, M/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 SOMWBA, M/WBE participation credit shall be given to the joint venture for the value of the Work that is performed by the M/WBE joint ventures’, and for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.
   C. If an M/WBE supplies but does not install equipment or materials, M/WBE participation credit shall be given only if the M/WBE supplier is regularly engaged in sales of equipment or supplies to the construction industry from an established place of business. M/WBE participation credit shall be given the full amount of the purchase order only if the M/WBE supplier manufactures the goods or substantially alters them before resale. In all other cases, M/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 M/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 State Office of Minority and Women Business Assistance (“SOMWBA”).
   B. A woman owned business shall be considered a WBE only if it has been certified as a woman business enterprise by SOMWBA.
   C. Certification as a disadvantaged business enterprise (“DBE”), certification as an M/WBE by any agency other than SOMWBA, or submission of an application to SOMWBA for certification as an M/WBE shall not confer M/WBE status on a firm for the purposes of this Contract.

4. Subcontracts With M/WBEs.
   Within thirty (30) days after the award of this Contract, the Contractor shall (i) execute a subcontract with each M/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 M/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 M/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 W/MBE in the Letters of Intent or Schedule of M/WBE Participation without the prior Approval of the Awarding Authority, nor shall any M/WBE assign or subcontract to any other firm, or permit any other firm to perform any of its M/WBE Work without the prior Approval of the Awarding Authority. Any such unapproved assignment, subcontracting, sub-subcontracting, or performances of M/WBE Work by others shall be a change in the M/WBE Work for the purposes of this Contract. The Awarding Authority WILL NOT APPLY TO THE M/WBE PARTICIPATION GOAL(S) ANY SUMS ATTRIBUTABLE TO SUCH UNAPPROVED ASSIGNMENTS, SUB-CONTRACTS, SUB-SUBCONTRACTS, OR PERFORMANCE OF M/WBE WORK BY OTHERS.
   B. The Contractor shall be responsible for monitoring the performance of M/WBE Work to ensure that each scheduled M/WBE performs its own M/WBE Work with its own workforce.
   C. The Contractor and each M/WBE shall provide the Awarding Authority with all information and documentation that the Awarding Authority determines is necessary to ascertain whether or not an M/WBE has performed its own M/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 M/WBE participation credit under this Contract that such M/WBE did not perform such work.

   A. If at any time during the performance of the Contract the Contractor determines or has reason to believe that a scheduled M/WMBE is unable or unwilling to perform its M/WBE Work, or that there has been or will be a change in any M/WMBE Work, or that the Contractor will be unable to meet the M/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 M/WBE Work pursuant to subparagraph “A” above shall include a revised Schedule of M/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 M/WBE Participation.

A. In the event there is a change or reduction in any M/WBE Work which will result in the Contractor failing to meet the M/WBE participation goal(s) for this Contract, other than a reduction in M/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 M/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 W/MBEs. 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 was not made available to M/WBEs and the reason for not making such work available for subcontracting to M/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 W/MBEs to all W/MBEs qualified to perform such work. The Contractor shall advise the Awarding Authority of (i) each W/MBE solicited, and (ii) each W/MBE listed in the SOMWBA 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 M/WBEs with telephone calls or personal visits in order to determine with certainty whether the M/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 M/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 M/WBE solicited, including the reason for rejecting any M/WBE who submitted a proposal.

6) The Contractor shall take any additional measures reasonably requested by the Awarding Authority to meet the M/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 M/WBEs, and/or sending written notification to M/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 M/WBEs.
B. If the Contractor is unable to meet the M/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 M/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 M/WBE Work which will result in the Contractor failing to meet the M/WBE participation goal(s) for this Contract, other than a reduction in M/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 equal to the value of the work which was to have been performed by an M/WBE pursuant to the Contractor’s Schedule of M/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 M/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 SOMWBA 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 M/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 M/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 M/WBE participation goals set forth in this Contract, and (y) the amount of M/WBE
participation credit earned by the Contractor for M/WBE Work performed under this Contract as determined by the Awarding Authority, the parties agreeing that the damages for failure to meet the M/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 SOMWBA 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/Procurement 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)

Procedure for Payment to Contractors
Daily Time and Material Report for Change Orders
Notice of Intent
Request and Agreement for a Change in the Plans,
  Specifications and/or Contract (UMA Form 5)
Instructions Regarding Change Orders and Contract Modifications (UMA Form 13)
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
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, UMA Form 16)
Certificate of Agency Use and Occupancy -E-1
Certificate of Final Inspection, Release and Acceptance - E-2
Form ST-SC
THE COMMONWEALTH OF MASSACHUSETTS
THE UNIVERSITY OF MASSACHUSETTS AMHERST
FACILITIES PLANNING
Physical Plant Building, 360 Campus Center Way, Amherst, MA 01003

PROCEDURE FOR PAYMENTS TO CONTRACTORS

I. APPLICATION AND DISTRIBUTION
This bulletin is effective on all construction projects Chapter 149 and Chapter 30 subject to the control of the University of Massachusetts Amherst Facilities Planning 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 procedure set forth in this form may be made without the express authorization of the University of Massachusetts Amherst (“UMASS”).

II. STATUTORY REFERENCES, DEFINITIONS, ETC. M.G.L. c. 30, s. 39K
Non-Building Contracts); University of Massachusetts Amherst Standard Vertical Construction Contract as amended. All General Contractors, Sub-Contractors, Designers, and Resident Engineers, University of Massachusetts Amherst Project Managers should thoroughly familiarize themselves with said contract.

III. PREPARATION AND PROCESSING OR PERIODIC PAYMENT
Periodic payment requests shall be submitted monthly, for the preceding month, corresponding to the date of the contract. Submission in this manner stagger the receipt of invoices in the University of Massachusetts Amherst office and expedites processing contractor payments. All invoices must include:

1. The Contractor’s Name
2. The UMA Contract Number
3. The UMA Project Number
4. The Project Name
5. The Purchase Order Number
6. Must clearly state that the invoice/requisition is exactly that, not a statement
7. Invoice Number or Requisition Number
8. Invoice Date
9. Period for which the work was completed
10. Schedule of Values
11. Approved Original Signatures
12. Notary

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The General Contractor and his sub-contractors, the Designer and the Resident Engineer(s) and University of Massachusetts Amherst Project Manager(s) shall approve 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 meeting/conference is the most effective way of resolving any questions of matters of dispute. The General Contractor shall submit to the Resident Engineer (or in the absence of a Resident Engineer, the University of Massachusetts Amherst – Project Manager (PM)) 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 specification 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 the standard AIA form G702-1992, Application and Certificate for payment or other periodic payment form approved by the Awarding Authority.

The General Contractor shall prepare sufficient copies of the request for periodic payment for submission to the University of Massachusetts Amherst Project Manager. To be distributed by the Awarding Authority as follows:

Original: University of Massachusetts Amherst Accounts Payable
Copy 1: Facilities Planning
Copy 2: University of Massachusetts Amherst Project Manager
Copy 3: Designer
Copy 4: Resident Engineer
Copy 5: Contractor
Copy 6,7: Required on Federally Aided projects only

IV. CERTIFICATION
The General Contractor shall sign all copies of the invoice/requisition and present same to the University of Massachusetts Amherst Project Manager certifying the value of the 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 AIA form attach to each copy a qualified certification and a recommendation as to the dollar value of the item or items in dispute to be-retained by Awarding Authority 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 AIA Form submitted with the formal request for payment in any manner. If the Division concurs with the Engineer and/or Designer’s recommendation, adjustment(s) shall be made to the AIA form 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 provision of M.G.L. c. 30, s39F which statement must be signed under penalty of perjury on each copy by the General Contractor.
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 M.G.L., c. 30, s 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 University of Massachusetts Amherst Project Manager or alternatively the home office of the Division of Facilities Planning, University of Massachusetts Amherst, Physical Plant Building, 360 Campus Center Way, Amherst, MA 01003. 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 University of Massachusetts Amherst, Division of Facilities Planning. 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 or University of Massachusetts Amherst Project Manager.

This invoice is public information and shall be requested via Public Records Requests to the business office of the Division.

VII. SPECIAL INSTRUCTION TO EMPLOYEES, PROJECT MANAGERS, RESIDENT ENGINEERS & DESIGNERS
The Resident Engineer, Project Managers and the Designer shall give their immediate attention to the certification of requests for periodic payments to contractors and under no circumstances are these requests to be delayed. The Resident Engineer, Project Managers and the Designer shall rigidly adhere to the instructions contained in this Bulletin and immediately expedite certification in order that the period payment requests may be delivered by the Contractor to Facilities Planning without delay. The Resident Engineer, Project Managers and the Designer shall process the payment expeditiously.
DAILY TIME AND MATERIAL REPORT FOR ALL CHANGE ORDER WORK OR WORK DONE UNDER PROTEST

UMA Project Number: __________ Project Number: ___________ Date: __________

Project Title: ____________________________

Contractor: ______________________________ Change Order No.: ________________

Or work under protest: __________

Sheet _____ of ______________

Was any contract work performed today other than Change Order concerned (Y/N)? __________

If Yes, list on Daily Progress Report.

Labor – Change Order or Alleged Extra Work Done Under Protest

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Submitted by Superintendent: 

Subcontractors: 

Resident Engineer/University of Massachusetts Project Manager (note any discrepancy in above Report): 

Resident Engineer/ University of Massachusetts Project Manager 

The signature of the Resident Engineer/Project Manager 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.

1. Materials Used (Describe fully) 

2. Misc. Equipment, Etc. (Describe fully) 

Submitted by Superintendent: 

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Subcontractors:

Resident Engineer/University of Massachusetts Amherst Project Manager (note any discrepancy in above Report):

Resident Engineer/ University of Massachusetts Amherst Project Manager __________________________

The signature of the Resident Engineer/Project Manager 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
University of Massachusetts Amherst, Facilities Planning

Contract Modification/Authorization to Proceed

(For Change Authorization in the Contract Plans and/or Specifications)

Date: ____________________

UMA Number: ____________________ Project Number: ____________________

Project Name: _______________________________________________________

Contractor: ____________________ 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: $_______________.00
(if checked) Additional Verification Backup Data Must Be Provided with Formal Change Order, See Attached

Lump Sum “NOT TO EXCEED”: $________________.00

(Maximum price based on contract unit prices or negotiated agreed unit prices)

“TIME AND MATERIALS” Not to Exceed: $________________.00

(Computed in accordance with Article VII of the General conditions)

Resident Engineer Date

Project Manager Date

Director Date

APPROVAL OF THIS NOTICE OF INTENT DOES NOT ADDRESS REQUESTS FOR ADDITIONAL TIME, EXTENSIONS OF CONTRACT TIME WILL BE ADDRESSED UPON SUBMITTAL OF THE OFFICIAL CHANGE ORDER. RECEIPT OF THIS REQUEST TO BE ACKNOWLEDGED IN WRITING TO UNIVERSITY OF MASSACHUSETTS AMHERST, FACILITIES PLANNING.

CERTIFICATION OF SUFFICIENT FUNDS BY: ___________________________ SPEED CODE: _______

COPY: Project Manager, Resident Engineer,
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 described 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.

<table>
<thead>
<tr>
<th>Resident Engineer</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Engineer</td>
<td></td>
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<tr>
<td>Project Manager</td>
<td></td>
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<tr>
<td>Deputy Director</td>
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</tbody>
</table>

IV. APPROVED BY THE OFFICE
(a) Operating Agency Letter (attached) ________(not req’d)___________
(b) For the amount requested/or corrected to $ _____________________________
© 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.

<table>
<thead>
<tr>
<th>Designer</th>
<th>Date</th>
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<tbody>
<tr>
<td>Do Not Fill in This Block</td>
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<tr>
<td>Contract Award $</td>
<td></td>
</tr>
<tr>
<td>Previous Addition $</td>
<td></td>
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<tr>
<td>Previous Net Total $</td>
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<tr>
<td>This Change $</td>
<td></td>
</tr>
<tr>
<td>Total To Date $</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contract Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended to ______ Date ____________</td>
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<tr>
<td>If applicable to Phase ______ Date ____________ of Contract</td>
</tr>
<tr>
<td>Office Change Order Approval # ____________</td>
</tr>
</tbody>
</table>

Authorized Signature ________________________________ Date ________________________________
Upon signature by the Office, this request becomes a formal change order for Immediate distribution.

DCAM FORM #5
4/10/02

OFFICE COPY ____ COMPTROLLER ____ PROJECT ENGINEER ____ DESIGNER ____
UNIVERSITY OF MASSACHUSETTS AMHERST

FACILITIES PLANNING

PHYSICAL PLANT BUILDING

360 CAMPUS CENTER WAY

AMHERST, MASSACHUSETTS  01003

INSTRUCTIONS REGARDING CHANGE ORDERS

AND

CONTRACT MODIFICATIONS

SECTION 1. STATUTORY AND CONTRACTUAL PROVISIONS

1.01. This instruction form supplements Article VII of the University of Massachusetts Amherst 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 University of Massachusetts Amherst.

The Statutory authorities for a change in the plans, specifications and/or contract are provided in Mass. G.L. Chapter 7, Section 42E-421 and in Massachusetts 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, SUBSTITUTE OR ELIMINATIONS) IN THE PLANS, SPECIFICATIONS OR CONTRACT SHALL BE COMMENCED UNTIL RECEIPT BY THE CONTRACTOR OF: (a) AN APPROVED BY THE UNIVERSITY OF MASSACHUSETTS AMHERST PURCHASE ORDER.

All requests for changes increasing the contract price must be submitted on the UMA Form 5, prior to the final acceptance of the project. The Contractor waives all rights against the University of Massachusetts Amherst if it fails to comply with this requirement. The University of Massachusetts Amherst 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 the University of Massachusetts Amherst.
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 all the change order work to be
accomplished in a timely and efficient manner.

It is the intention of the University of Massachusetts Amherst and the applicable statutory provision 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, within ten (10) days of proposed requests for
change, cost estimates for a proposed change in the work, the project manager may unilaterally
determine the reasonable cost for the change, and the Contractor must proceed with the work based
upon the project manager’s established cost.

SECTION 2.  SUBMISSION AND DISPOSITION OF THE UNIVERSITY OF MASSACHUSETTS AMHERST
NOTICE OF INTENT (“NOI”)

2.01 AUTHORIZED REQUESTORS:
   a) General Contractor, including Sub-Contractor
   b) Designer
   c) University of Massachusetts Amherst Project Manager, Assistant Directors or Director of
      Facilities Planning

2.02 THE REQUESTOR SHALL:
   a) Initially discuss the proposed request for change with all interested parties.
   b) If the Designer or the University of Massachusetts Amherst is the requestor, forward to the
      contractor a written request for proposal.
   c) 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) 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 UMA 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 fielded 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 NOI and accompanying documentation shall be addressed to the Division of Facilities Planning and sent to the Project Manager. One copy shall be addressed to the Designer, and one to the Resident Engineer (if applicable).

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/UNIVERSITY OF MASSACHUSETTS PM (IF NO RESIDENT ENGINEER) SHALL:

   a) Note the receipt of written request for NOI in the record of NOIs/Change Orders, diary, and daily report.

   b) Inform the Designer, the Project Manager (if applicable) and the Project Engineer of the request for NOI.

   c) Review both quantities and prices of labor and materials and recommend corrections of 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 University of Massachusetts Amherst 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 the University of Massachusetts Project Manager or Project Engineer.

2.05.1 THE UNIVERSITY OF MASSACHUSETTS AMHERST PROJECT MANAGER (PM) SHALL

If the University of Massachusetts Amherst PM agrees with the request for change and the Contractor’s proposal it shall promptly issue and NOI using the University of Massachusetts NOI 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 order of work.

If the University of Massachusetts Amherst PM 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 UNIVERSITY OF MASSACHUSETTS AMHERST FORM 5  
(UMA FORM 5)

3.01 THE CONTRACTOR SHALL:
   a) Complete applicable portions of Section I of Form 5 (one (1) original green sheet unless otherwise instructed by the Awarding Authority).
   b) If there is sufficient 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 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 Materials basis” must be adjusted by the University of Massachusetts Daily Time and Material Report Forms.
   d) If additional time is requested, furnish an explanation with 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 one (1) Form 5, complete in accordance with these procedures to the University of Massachusetts Project Manager.

3.02 THE RESIDENT ENGINEER/UNIVERSITY OF MASSACHUSETTS PM (IF NO 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 University of Massachusetts Project Manager (if applicable) 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 subcontractors on properly identifiable letterhead.
   e) If any request is inaccurate, incomplete, contains insufficient credits due to the University of Massachusetts 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 reason for substitution or elimination, and if the change request is of any other nature, the reasons for such change, giving justification therefore. 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/University of Massachusetts Amherst are included and if salvageable.

4) A statement of concurrence that the description of the work in Section 1 (h) 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) References 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 (2) copies of the Form 5, all with original signatures to the University of Massachusetts Amherst 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 the University of Massachusetts Amherst.

3.04 UNIVERSITY OF MASSACHUSETTS AMHERST PM SHALL:
a) Notify all parties if funds are insufficient to cover the change and return to the Contractor, through the Resident Engineer (if applicable), 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, the University of Massachusetts Amherst PM shall issue a Purchase Order to the General Contractor.
d) If the University of Massachusetts PM 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 receipt of notice, appeal such action to the Director of Facilities Planning (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 Director of Facilities Planning 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 DIRECTOR OF FACILITIES PLANNING’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 THEIR ASSISTANT DIRECTOR FOR FACILITIES PLANNING, THE UNIVERSITY OF MASSACHUSETTS AMHERST PM SHALL APPROVE CHANGE ORDERS FOR THE UNIVERSITY OF MASSACHUSETTS AMHERST 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 ACCOMPANYED BY COPIES OF PAID INVOICES.


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, ME 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 UNIVERSITY OF MASSACHUSETTS PM MAY APPROVE LUMP SUM CHANGE ORDER REQUESTS ON CHANGES COSTING $1,000 OR LESS, WITHOUT REQUIRING THE CONTRACTOR TO PROVIDES A BREAKDOWN FOR THE COSTS INCURRED ON THE CHANGE. THE UNIVERSITY OF MASSACHUSETTS PM 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 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. The University of Massachusetts 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 Contractors.

h) 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.

<table>
<thead>
<tr>
<th>Contract Price</th>
<th>Rates per Thousand</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Contracts up to $500,000</td>
<td>$14.40</td>
</tr>
<tr>
<td>b) $500,000 to $2,500,000</td>
<td>$ 8.70</td>
</tr>
<tr>
<td>c) $2,500,000 to $5,000,000</td>
<td>$ 6.90</td>
</tr>
<tr>
<td>d) $5,000,000 to $7,000,000</td>
<td>$ 6.30</td>
</tr>
<tr>
<td>e) $7,500,000 and up</td>
<td>$ 5.76</td>
</tr>
</tbody>
</table>

5.08 IF A CONTRACTOR DESIRES TO BE COMPENSATED AS AUTHORIZED WORK PROGRESSES, IT SHALL, AFTER RECEIPT OF AN NOI, IMMEDIATELY SUBMIT A UMA FORM 5 AS OUTLINED IN PARAGRAPH 3.01.
CONTRACTOR’S WEEKLY WORKFORCE REPORT

UNIVERSITY OF MASSACHUSETTS AMHERST

UMA No.  Project Number

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
MINORITIES/WOMEN IN CONTRACTOR’S WEEKLY WORKFORCE REPORT

THE UNIVERSITY OF MASSACHUSETTS AMHERST

UMA No. ___________________________ Project No. ___________________________

Project Name _______________________________________________________________

Name of General Contractor _________________________________________________

Project Location ___________________________________________________________

Name of Contractor Filing Report _____________________________________________

Address ____________________________

Week Ending ___________________________ Report No. ____________________________

<table>
<thead>
<tr>
<th>JOB CATEGORY</th>
<th>NAME OF EMPLOYEE</th>
<th>MINORITY GROUP</th>
<th>GENDER</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

In contract Article XII, “Minority” refers to: Asian-Americans, Blacks, Western Hemisphere Hispanics, Native Americans, and Cape Verdians

Minorities/Women in Contractor’s Weekly Workforce Report - Revised 10/01

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WEEKLY PAYROLL REPORT FORM

THE UNIVERSITY OF MASSACHUSETTS AMHERST

UMA Project No. ___________________ 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 __________________

<table>
<thead>
<tr>
<th>Employee Name &amp; Address</th>
<th>Work Classification</th>
<th>Hours Worked</th>
<th>(A) Total Hours</th>
<th>(B) Hourly Base Wage</th>
<th>(C) Health &amp; Welfare</th>
<th>(D) Pension</th>
<th>(E) Supp. Unemp.</th>
<th>(F) [B+C+D+E] Hourly Total Wage (prev. wage)</th>
<th>(G) [A*F] Weekly Total Amount</th>
</tr>
</thead>
</table>

NOTE: Every contractor and subcontractor is required to submit a copy of their weekly payroll records to University of Massachusetts Amherst. **Handwritten payroll records will not be accepted. An excel format Weekly payroll report form can be found on the Procurement website:**

http://www.umass.edu/procurement/constructionprojects.htm

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: University of Massachusetts Amherst

Procurement Manager/Administrative Services
Physical Plant Building
360 Campus Center Way
Amherst, MA 01003
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
<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
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<tbody>
<tr>
<td>(2 AXLE) DRIVER - EQUIPMENT</td>
<td>08/01/2016</td>
<td>$32.15</td>
<td>$10.91</td>
<td>$10.08</td>
<td>$0.00</td>
<td>$53.14</td>
</tr>
<tr>
<td>TEAMSTERS:JOINT COUNCIL NO. 10 ZONE B</td>
<td>12/01/2016</td>
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<td>$10.91</td>
<td>$10.89</td>
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<td>$53.95</td>
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<tr>
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<td>$10.91</td>
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<td>$0.00</td>
<td>$54.02</td>
</tr>
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"
### Apprentices - BOILERMAKER - Local 29

**Effective Date:** 01/01/2016

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**Notes:**

*Apprentice to Journeyworker Ratio: 1:5*

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**BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)**

- **BOILERMaker LOCAL 29**
  - **LocaL 29**
- **BRICKLAYERS LOCAL 3 (SPRINGFIELD/PITTSFIELD)**

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**Notes:**

Apprentice to Journeyworker Ratio: 1:5

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

**For apprentice rates see "Apprentice- LABORER"**

**For apprentice rates see "Apprentice- LABORER"**

**For apprentice rates see "Apprentice- LABORER"**

**For apprentice rates see "Apprentice- LABORER"**

**For apprentice rates see "Apprentice- LABORER"**

**For apprentice rates see "Apprentice- LABORER"**

**For apprentice rates see "Apprentice- LABORER"**

**For apprentice rates see "Apprentice- LABORER"**
### CARPENTER - Local 108 Hampden Hampshire

**Effective Date:** 02/29/2016

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**Notes:**
- Pre-6/09 Step1 $25.60/2 $27.23/3 $42.83/4 $46.09/5 $49.35/6 $50.98
- **1: 1-5/2: 6-8/3: 9-11/Steps: 6 mos (600 hrs)/rates by step**
- 7 $52.61/8 $54.24

**Apprentice to Journeyworker Ratio:**

### CEMENT MASONRY/PLASTERING - Springfield/Pittsfield

**Effective Date:** 01/01/2016

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**Notes:**
- Apprentice wages shall be no less than the following Steps:
  - $46.33/2 $53.77/3 $57.10/4 $60.42/5 $63.74/6 $67.06/7 $72.71
- Steps 3-4 are 500 hrs. All other steps are 1,000 hrs.

**Apprentice to Journeyworker Ratio:** 1:3

### CHAIN SAW OPERATOR - ZONE 3 (BUILDING & SITE)

**Effective Date:** 06/06/2016

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**Notes:**
- For apprentice rates see "Apprentice- LABORER"

### COMPRESSOR OPERATOR - OPERATING ENGINEERS LOCAL 98

**Effective Date:** 06/01/2016

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**Notes:**
- For apprentice rates see "Apprentice- OPERATING ENGINEERS"
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

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### Apprentice - PAINTER Local 35 - BRIDGES/TANKS

#### Effective Date - 07/01/2016

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Notes:
- Steps are 750 hrs.

Apprentice to Journeyworker Ratio: 1:1

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### DEMO: ADZEMAN

LABORS - ZONE 3 (BUILDING & SITE)

For apprentice rates see "Apprentice- LABORER"

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### DEMO: BACKHOE/LOADER/HAMMER OPERATOR

LABORS - ZONE 3 (BUILDING & SITE)

For apprentice rates see "Apprentice- LABORER"

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### DEMO: BURNERS

LABORS - ZONE 3 (BUILDING & SITE)

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**Issue Date:** 10/05/2016  
**Wage Request Number:** 20161005-022  
**Page 7 of 34**
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| Effective Date - 01/01/2017         |

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**Notes:** Pre-5/31/11 Begins at Step 3 $41.19/4$43.49/$45.59/6$47.79
Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

**Apprentice to Journeyworker Ratio:** 2:3****
### Classification

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**Notes:**

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

### Apprentice - ELEVATOR CONSTRUCTOR - Local 41

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**Notes:**

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

### Apprentice to Journeyworker Ratio: 1:1

### ELEVATOR CONSTRUCTOR HELPER

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**For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"**

### FENCE & GUARD RAIL ERECTORS (HEAVY & HIGHWAY)

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**For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"**

### FIELD ENG. INST/ROD-BLDG, SITE, HVY/HWY

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**FIELD ENG. PARTY CHIEF: BLDG, SITE, HVY/HWY**

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**FIELD ENG. SURVEY CHIEF: BLDG, SITE, HVY/HWY**

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**For apprentice rates see "Apprentice- ELECTRICIAN"**

### FIRE ALARM REPAIR / MAINTENANCE

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**For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"**
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**Apprentice - OPERATING ENGINEERS - Local 98 Class 3**

**Effective Date - 06/01/2016**

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**Notes:**
Steps 1-2 are 1000 hrs.; Steps 3-4 are 2000 hrs.

**Apprentice to Journeyworker Ratio: 1:6**

**FLAGGER & SIGNALER (HEAVY & HIGHWAY)**

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For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

**FLOORCOVERER**

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Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio: 1:1

FORK LIFT
OPERATING ENGINEERS LOCAL 98

| 06/01/2016 | $33.07 | $10.38 | $12.01 | $0.00 | $55.46 |
| 12/01/2016 | $33.47 | $10.58 | $12.28 | $0.00 | $56.33 |
| 06/01/2017 | $34.08 | $10.58 | $12.55 | $0.00 | $57.21 |
| 12/01/2017 | $34.68 | $10.58 | $12.82 | $0.00 | $58.08 |
| 06/01/2018 | $35.29 | $10.58 | $13.09 | $0.00 | $58.96 |
| 12/01/2018 | $35.89 | $10.58 | $13.36 | $0.00 | $59.83 |
| 06/01/2019 | $36.40 | $10.58 | $13.63 | $0.00 | $60.61 |
| 12/01/2019 | $37.00 | $10.58 | $13.90 | $0.00 | $61.48 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GENERATORS/LIGHTING PLANTS
OPERATING ENGINEERS LOCAL 98

| 06/01/2016 | $29.62 | $10.38 | $12.01 | $0.00 | $52.01 |
| 12/01/2016 | $30.02 | $10.58 | $12.28 | $0.00 | $52.88 |
| 06/01/2017 | $30.63 | $10.58 | $12.55 | $0.00 | $53.76 |
| 12/01/2017 | $31.23 | $10.58 | $12.82 | $0.00 | $54.63 |
| 06/01/2018 | $31.84 | $10.58 | $13.09 | $0.00 | $55.51 |
| 12/01/2018 | $32.44 | $10.58 | $13.36 | $0.00 | $56.38 |
| 06/01/2019 | $32.95 | $10.58 | $13.63 | $0.00 | $57.16 |
| 12/01/2019 | $33.55 | $10.58 | $13.90 | $0.00 | $58.03 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)
GLAZIERS LOCAL 1333

| 06/01/2016 | $35.58 | $10.70 | $8.25 | $0.00 | $54.53 |
### GLAZIER - Local 1333

#### Effective Date - 06/01/2016

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#### Notes:

**Apprentice to Journeyworker Ratio:** 1:3

---

### FOR APPRENTICE - OPERATING ENGINEERS

**GRADER/TRENCHING MACHINE/DERRICK**

**OPERATING ENGINEERS LOCAL 98**

- **Effective Date:** 06/01/2016
- **Base Wage:** $33.38
- **Health:** $10.38
- **Pension:** $12.01
- **Supplemental Unemployment:** $0.00
- **Total Rate:** $55.77

- **Effective Date:** 12/01/2016
- **Base Wage:** $33.78
- **Health:** $10.58
- **Pension:** $12.28
- **Supplemental Unemployment:** $0.00
- **Total Rate:** $56.64

**HVAC (DUCTWORK)**

**SHEETMETAL WORKERS LOCAL 63**

- **Effective Date:** 07/01/2016
- **Base Wage:** $32.28
- **Health:** $10.54
- **Pension:** $14.90
- **Supplemental Unemployment:** $1.70
- **Total Rate:** $59.42

- **Effective Date:** 01/01/2017
- **Base Wage:** $33.03
- **Health:** $10.54
- **Pension:** $14.90
- **Supplemental Unemployment:** $1.70
- **Total Rate:** $60.17

**HVAC (ELECTRICAL CONTROLS)**

**ELECTRICIANS LOCAL 7**

- **Effective Date:** 07/03/2016
- **Base Wage:** $39.11
- **Health:** $9.35
- **Pension:** $10.32
- **Supplemental Unemployment:** $0.00
- **Total Rate:** $58.78

- **Effective Date:** 01/01/2017
- **Base Wage:** $40.01
- **Health:** $9.35
- **Pension:** $10.32
- **Supplemental Unemployment:** $0.00
- **Total Rate:** $59.68

**HVAC (TESTING AND BALANCING - AIR)**

**SHEETMETAL WORKERS LOCAL 63**

- **Effective Date:** 03/17/2016
- **Base Wage:** $38.26
- **Health:** $8.45
- **Pension:** $15.05
- **Supplemental Unemployment:** $0.00
- **Total Rate:** $61.76

**HVAC MECHANIC**

**PLUMBERS & PIPEFITTERS LOCAL 104**

- **Effective Date:** 03/17/2016
- **Base Wage:** $38.26
- **Health:** $8.45
- **Pension:** $15.05
- **Supplemental Unemployment:** $0.00
- **Total Rate:** $61.76

**HYDRAULIC DRILLS (HEAVY & HIGHWAY)**

**LABORERS - ZONE 3 (HEAVY & HIGHWAY)**

- **Effective Date:** 06/01/2016
- **Base Wage:** $29.75
- **Health:** $7.45
- **Pension:** $10.52
- **Supplemental Unemployment:** $0.00
- **Total Rate:** $47.72

- **Effective Date:** 12/01/2016
- **Base Wage:** $30.50
- **Health:** $7.45
- **Pension:** $10.52
- **Supplemental Unemployment:** $0.00
- **Total Rate:** $48.47
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**Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Springfield**

**Effective Date - 09/01/2016**

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**Effective Date - 09/01/2017**

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**Notes:**

Steps are 1 year

**Apprentice to Journeyworker Ratio: 1:4**

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### Apprentice - IRONWORKER - Local 7 Springfield

**Effective Date:** 09/16/2016

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**Notes:**
Structural 1:6; Ornamental 1:4

**Apprentice to Journeyworker Ratio:**

**JACKHAMMER & PAVING BREAKER OPERATOR**

| 06/06/2016 | $29.40 | $7.45 | $12.40 | $0.00 | $49.25 |
| 12/05/2016 | $30.08 | $7.45 | $12.40 | $0.00 | $49.93 |

For apprentice rates see "Apprentice- LABORER"

**LABORER**

| 06/06/2016 | $29.15 | $7.45 | $12.40 | $0.00 | $49.00 |
| 12/05/2016 | $29.83 | $7.45 | $12.40 | $0.00 | $49.68 |
### LABORER - Zone 3 Building & Site

#### Effective Date: 06/06/2016

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#### Notes:

- Apprentice to Journeyworker Ratio: 1:5

### LABORER (HEAVY & HIGHWAY)

#### LABORERS - ZONE 3 (HEAVY & HIGHWAY)

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### LABORER (Heavy & Highway) - Zone 3

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#### Notes:

- Apprentice to Journeyworker Ratio: 1:5

### LABORER: CARPENTER TENDER

#### LABORERS - ZONE 3 (BUILDING & SITE)

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For apprentice rates see "Apprentice- LABORER"
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### Apprentices - MARBLE TILE TERRAZZO FINISHER - Local 3 Marble/Tile (Spr/Pitt)

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**Notes:**

Apprentice to Journeyworker Ratio: 1:5

### MARBLE MASONS, TILELAYERS & TERRAZZO MECH - BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE

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### Apprentices - MARBLE TILE TERRAZZO MECH - Local 3 Marble/Tile (Spr/Pitt)

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**Notes:**

Apprentice to Journeyworker Ratio: 1:5
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**Apprentice - MILLWRIGHT - Local 1121 Zone 3**

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Notes:

- Steps are 2,000 hours

Apprentice to Journeyworker Ratio: 1:5

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### OTHER POWER DRIVEN EQUIPMENT - CLASS VI

**OPERATING ENGINEERS LOCAL 98**

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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

### PAINTER (BRIDGES/TANKS)

**PAINTERS LOCAL 35 - ZONE 3**

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**Apprentice - PAINTER Local 35 - BRIDGES/TANKS**

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**Notes:**
- Steps are 750 hrs.
- **Apprentice to Journeyworker Ratio**: 1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *

* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. **PAINTERS LOCAL 35 - ZONE 3**
### Apprentice - PAINTER Local 35 Zone 3 - Spray/Sandblast - New

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#### Notes:
- Steps are 750 hrs.
- Apprentice to Journeyworker Ratio: 1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)  
PAINTERS LOCAL 35 - ZONE 3

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**Notes:**
- Steps are 750 hrs.
- Apprentice to Journeyworker Ratio: 1:1

*PAINTER / TAPER (BRUSH, NEW) *

* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. **PAINTERS LOCAL 35 - ZONE 3**

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</table>

Notes:
- Steps are 750 hrs.
- Apprentice to Journeyworker Ratio: 1:1

PAINTER / TAPER (BRUSH, REPAINT)

PAINTERS LOCAL 35 - ZONE 3
### Apprentice - PAINTER Local 35 Zone 3 - BRUSH REPAINT

<table>
<thead>
<tr>
<th>Step</th>
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### Effective Date - 01/01/2017

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**Notes:** Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:** 1:1

**PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)**

<table>
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<tr>
<th>Laborers - Zone 3 (HEAVY &amp; HIGHWAY)</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/01/2016</td>
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<tr>
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For apprentice rates see *Apprentice- LABORER (Heavy and Highway)*

**PANEL & PICKUP TRUCKS DRIVER**

TEAMSTERS JOINT COUNCIL NO. 10 ZONE B

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
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</thead>
<tbody>
<tr>
<td>12/01/2012</td>
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**PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)**

PILE DRIVER LOCAL 56 (ZONE 3)

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<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
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<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/31/2015</td>
<td>$39.00</td>
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For apprentice rates see *Apprentice- PILE DRIVER*

**PILE DRIVER**

PILE DRIVER LOCAL 56 (ZONE 3)

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<tr>
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<tbody>
<tr>
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<td>$9.80</td>
<td>$18.17</td>
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<td>$66.97</td>
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<td>Effective Date</td>
<td>Base Wage</td>
<td>Health</td>
<td>Pension</td>
<td>Supplemental Unemployment</td>
</tr>
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<td>----------------</td>
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<td>--------</td>
<td>---------</td>
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<td>Apprentice - PILE DRIVER - Local 56 Zone 3</td>
<td>08/31/2015</td>
<td>$0.00</td>
<td>$0.00</td>
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<td>$0.00</td>
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**Notes:** Apprentice wages shall be no less than the following Steps;
(Same as set in Zone 1)
1 $50.05/2 $54.25/3 $58.46/4 $60.56/5 $62.66/6 $62.66/7 $66.87/8 $66.87

Apprentice to Journeyworker Ratio: 1:3

<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPELAYER LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td>06/06/2016</td>
<td>$29.40</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.25</td>
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</table>
12/05/2016 | $30.08 | $7.45 | $12.40 | $0.00 | $49.93 |

For apprentice rates see "Apprentice- LABORER"

<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPELAYER (HEAVY &amp; HIGHWAY) LABORERS - ZONE 3 (HEAVY &amp; HIGHWAY)</td>
<td>06/01/2016</td>
<td>$29.25</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.22</td>
</tr>
</tbody>
</table>
12/01/2016 | $30.00 | $7.45 | $10.52 | $0.00 | $47.97 |

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLUMBER &amp; PIPEFITTER PLUMBERS &amp; PIPEFITTERS LOCAL 104</td>
<td>03/17/2016</td>
<td>$38.26</td>
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<td>$0.00</td>
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</table>

Notes:
Steps are 2000 hrs.

Apprentice to Journeyworker Ratio: 1:5

<table>
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<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
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</thead>
<tbody>
<tr>
<td>PNEUMATIC CONTROLS (TEMP.) PLUMBERS &amp; PIPEFITTERS LOCAL 104</td>
<td>03/17/2016</td>
<td>$38.26</td>
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For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

<table>
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<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNEUMATIC DRILL/TOOL OPERATOR (HEAVY &amp; HIGHWAY) LABORERS - ZONE 3 (HEAVY &amp; HIGHWAY)</td>
<td>06/01/2016</td>
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<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.22</td>
</tr>
</tbody>
</table>
12/01/2016 | $30.00 | $7.45 | $10.52 | $0.00 | $47.97 |

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWDERMAN &amp; BLASTER LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td>06/06/2016</td>
<td>$30.15</td>
<td>$7.45</td>
<td>$12.40</td>
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<td>$50.00</td>
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12/05/2016 | $30.83 | $7.45 | $12.40 | $0.00 | $50.68 |

For apprentice rates see "Apprentice- LABORER"

<table>
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<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
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</thead>
<tbody>
<tr>
<td>POWDERMAN &amp; BLASTER (HEAVY &amp; HIGHWAY) LABORERS - ZONE 3 (HEAVY &amp; HIGHWAY)</td>
<td>06/01/2016</td>
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12/01/2016 | $30.75 | $7.45 | $10.52 | $0.00 | $48.72 |
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<th>Supplemental Unemployment</th>
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<table>
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<th>PUMP OPERATOR (DEWATERING, OTHER)</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

| READY-MIX CONCRETE DRIVER       | 05/01/2016     | $21.01    | $10.23 | $9.40   | $0.00                     | $40.64     |

| RESIDENTIAL WOOD FRAME CARPENTER** | 02/29/2016     | $26.81    | $7.20  | $5.35   | $0.00                     | $39.36     |

** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement. CARPENTERS LOCAL 108 - HAMPDEN HAMPSHIRE

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

<table>
<thead>
<tr>
<th>Apprentice - CARPENTER (Residential Wood Frame) - 108 Hampden Hampshire</th>
<th>Effective Date - 02/29/2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step</td>
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<td>------</td>
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</tr>
<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
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<td>90</td>
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</tbody>
</table>

Notes:
** 1: 1-5, 2: 6-8, 3: 9-11

Apprentice to Journeyworker Ratio:**

| RIDE-ON MOTORIZED BUGGY OPERATOR | 06/06/2016     | $29.40    | $7.45  | $12.40  | $0.00                     | $49.25     |
| LABORERS - ZONE 3 (BUILDING & SITE) | 12/05/2016     | $30.08    | $7.45  | $12.40  | $0.00                     | $49.93     |

For apprentice rates see "Apprentice- LABORER"
<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

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For apprentice rates see "Apprentice- ROOFER"

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### Apprentice - ROOFER - Local 248

#### Effective Date - 07/01/2016

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#### Effective Date - 10/16/2016

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**Notes:** Steps are 750 hrs.Roof( Tear Off):1:1; Same as above

**Apprentice to Journeyworker Ratio:** 1:3

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For apprentice rates see "Apprentice- ROOFER"
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### SHEET METAL WORKER - Local 63

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### Painters Local 35 - Zone 3

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## SIGN ERECTOR - Local 35 Zone 3

### Effective Date: 06/01/2013

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### Notes:
- Steps are 4 mos.

### Apprentice to Journeyworker Ratio: 1:1

#### SPECIALIZED EARTH MOVING EQUIP < 35 TONS
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B

<table>
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#### SPECIALIZED EARTH MOVING EQUIP > 35 TONS
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B

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#### SPRINKLER FITTER
SPRINKLER FITTERS LOCAL 669

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### Apprentices - SPRINKLER FITTER - Local 669

**Effective Date - 04/01/2016**

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**Notes:**

Apprentice to Journeyworker Ratio: 1:1

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### TELECOMMUNICATION TECHNICIAN

**ELECTRICIANS LOCAL 7**

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**Issue Date:** 10/05/2016  **Wage Request Number:** 20161005-022  **Page 30 of 34**
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Notes:
- Steps are 800 hours

Apprentice to Journeyworker Ratio: 1:1
### MARBLE-TILE-TERRAZZO FINISHER - Local 3 Marble/Tile (Spr/Pitt)

**Effective Date:** 09/05/2016

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**Notes:**

- Apprentice to Journeyworker Ratio: 1:5

### TEST BORING DRILLER

**Laborers - Foundation and Marine**

- 06/01/2016: $37.20 + $7.45 + $14.00 = $58.65
- 12/01/2016: $38.20 + $7.45 + $14.00 = $59.65

For apprentice rates see "Apprentice-Laborer"

### TEST BORING DRILLER HELPER

**Laborers - Foundation and Marine**

- 06/01/2016: $35.92 + $7.45 + $14.00 = $57.37
- 12/01/2016: $36.92 + $7.45 + $14.00 = $58.37

For apprentice rates see "Apprentice-Laborer"

### TEST BORING LABORER

**Laborers - Foundation and Marine**

- 06/01/2016: $35.80 + $7.45 + $14.00 = $57.25
- 12/01/2016: $36.80 + $7.45 + $14.00 = $58.25

For apprentice rates see "Apprentice-Laborer"

### TRactors

**Operating Engineers Local 98**

- 06/01/2016: $32.24 + $10.38 + $12.01 = $54.63
- 12/01/2016: $32.64 + $10.58 + $12.28 = $55.50
- 06/01/2017: $33.25 + $10.58 + $12.55 = $56.38
- 12/01/2017: $33.85 + $10.58 + $12.82 = $57.25
- 06/01/2018: $34.46 + $10.58 + $13.09 = $58.13
- 12/01/2018: $35.06 + $10.58 + $13.36 = $59.00
- 06/01/2019: $35.57 + $10.58 + $13.63 = $59.78
- 12/01/2019: $36.17 + $10.58 + $13.90 = $60.65

For apprentice rates see "Apprentice-Operating Engineers"

### Trailers for Earth Moving Equipment

**Teamsters Joint Council No. 10 Zone B**

- 08/01/2016: $33.02 + $10.91 + $10.08 = $54.01
- 12/01/2016: $33.02 + $10.91 + $10.89 = $54.82

### Tunnel Work - Compressed Air

**Laborers (Compressed Air)**

- 06/01/2016: $48.08 + $7.45 + $14.40 = $69.93
- 12/01/2016: $49.08 + $7.45 + $14.40 = $70.93

For apprentice rates see "Apprentice-Laborer"

### Tunnel Work - Compressed Air (Haz. Waste)

**Laborers (Compressed Air)**

- 06/01/2016: $50.08 + $7.45 + $14.40 = $71.93
- 12/01/2016: $51.08 + $7.45 + $14.40 = $72.93
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| Apprentice - LINEMAN (Outside Electrical) - West Local 42                      | 08/30/2015     | $29.28    | $8.20  | $0.88   | $0.00                    | $38.36     |
| Effective Date - percent                                                       |             |           |        |         |                          |            |
| Step 60                                                                        |             |           |        |         |                          |            |
| Step 65                                                                        |             |           |        |         |                          |            |
| Step 70                                                                        |             |           |        |         |                          |            |
| Step 75                                                                        |             |           |        |         |                          |            |
| Step 80                                                                        |             |           |        |         |                          |            |
| Step 85                                                                        |             |           |        |         |                          |            |
| Step 90                                                                        |             |           |        |         |                          |            |

| Notes:                                                                         |             |           |        |         |                          |            |
| Apprentice to Journeyworker Ratio:1:2                                           |             |           |        |         |                          |            |

Issue Date: 10/05/2016  Wage Request Number: 20161005-022  Page 33 of 34
### Classification

#### TELEDATA CABLE SPlicer
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<td>01/01/2016</td>
<td>$27.31</td>
<td>$4.25</td>
<td>$3.07</td>
<td>$0.00</td>
<td>$34.63</td>
</tr>
</tbody>
</table>

#### TELEDATA WIREMAN/INSTALLER/TECHNICIAN
*OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/01/2016</td>
<td>$27.31</td>
<td>$4.25</td>
<td>$3.07</td>
<td>$0.00</td>
<td>$34.63</td>
</tr>
</tbody>
</table>

#### TRACTOR-TRAILER DRIVER
*OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/30/2015</td>
<td>$42.16</td>
<td>$8.20</td>
<td>$9.26</td>
<td>$0.00</td>
<td>$59.62</td>
</tr>
</tbody>
</table>

#### TREE TRIMMER
*OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/31/2016</td>
<td>$18.51</td>
<td>$3.55</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$22.06</td>
</tr>
</tbody>
</table>

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company’s equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground. This classification does not apply to wholesale tree removal.

#### TREE TRIMMER GROUNDMAN
*OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/31/2016</td>
<td>$16.32</td>
<td>$3.55</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$19.87</td>
</tr>
</tbody>
</table>

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company’s equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.

---

Additional Apprentice Information:

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

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

All steps are six months (1000 hours.) Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.

*** APP to JM: 1:1, 1:2, 2:3, 3:4, 4:5, 5:7, 7:10, 10:13, 10:14, etc.

**** APP to JM: 1:1, 1:2, 2:3, 3:5, 4:6, 5:8, 6:9, 8:10, 10:15, 10:16, etc.
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

__________________________________________ on the ____________________________________________

(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 _____________________________________
<table>
<thead>
<tr>
<th>QUARTERLY PROJECTED WORKFORCE TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIVERSITY OF MASSACHUSETTS AMHERST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UMA Number</th>
<th>Project No.</th>
<th>Project Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Telephone No</th>
<th>Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scope of Work</th>
<th>Trades Utilized</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estimate of Total Hours to Complete Work of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estimate of Total Hours of Work Remaining on Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Contract Dollar Value $</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quarter: Beginning</th>
<th>Ending</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade Categories</td>
<td>Projected Total Hours By All Personnel</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td><strong>MONTH-</strong></td>
<td></td>
</tr>
<tr>
<td>Laborers</td>
<td></td>
</tr>
<tr>
<td>Other Trades</td>
<td></td>
</tr>
<tr>
<td><strong>MONTH-</strong></td>
<td></td>
</tr>
<tr>
<td>Laborers</td>
<td></td>
</tr>
<tr>
<td>Other Trades</td>
<td></td>
</tr>
<tr>
<td><strong>MONTH-</strong></td>
<td></td>
</tr>
<tr>
<td>Laborers</td>
<td></td>
</tr>
<tr>
<td>Other Trades</td>
<td></td>
</tr>
</tbody>
</table>

Authorized Signature ________________________ Title ________________________ Date ________________________

Note: A revised table must be submitted if any changes on projection occur.

Quarterly Projected Workforce Table - Revised 10/01
CERTIFICATE OF PAYMENT

BY CONTRACTOR/DESIGNER TO MINORITY & WOMEN BUSINESS ENTERPRISES
UNIVERSITY OF MASSACHUSETT AMHERST

TO: University of Massachusetts Amherst
Facilities Planning
360 Campus Center Way
Amherst, MA 01003

Reporting
Period______________________

Physical Plant Building

Contract Date

______________________

Design Contract

Construction Contract

RE: UMA No.______________________________

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:

<table>
<thead>
<tr>
<th>MBE/WBE Firm Name</th>
<th>Work Performed</th>
<th>Subcontract Amount</th>
<th>Payments This Quarter</th>
<th>Cumulative Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBE</td>
<td>$</td>
<td></td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>WBE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MBE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MBE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

187
☐ MBE
☐ WBE
$   $   $

☐ MBE
☐ WBE
$   $   $

☐ MBE
☐ 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 University of Massachusetts Amherst 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 University of Massachusetts Amherst projects, the Compliance Office has prepared these instructions to assist you in completing the enclosed form. PLEASE READ THESE INSTRUCTIONS CAREFULLY. UNIVERSITY OF MASSACHUSETTS AMHERST 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 UNIVERSITY OF MASSACHUSETTS AMHERST, FACILITIES PLANNING.

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 Director of Facilities Planning responsible for this project and a Revised M/WBE Schedule of Participation will be required. Contact the University of Massachusetts Amherst, Facilities Planning Project Manager 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 SOMWA-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 University of Massachusetts Amherst, Facilities Planning Project Manager 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 University of Massachusetts Amherst, Facilities Planning Project Manager 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 UNIVERSITY OF MASSACHUSETTS AMHERST, FACILITIES PLANNING PROJECT MANAGER.

Certification of Payment Revised 10/01
CERTIFICATE OF COMPLETION

BY MINORITY/WOMEN BUSINESS ENTERPRISE
UNIVERSITY OF MASSACHUSETTS AMHERST

UMA Number________________ 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

Authorized Signature________________________________________  
Print Name___________________________________________________  
Title_________________________________________________________  
Date____________ Telephone No.________________

FOR MBE/WBE FIRM

Authorized Signature________________________________________  
Print Name___________________________________________________  
Title_________________________________________________________  
Date____________ Telephone No.________________

NOTE: To be submitted to the University of Massachusetts Amherst within ten (10) days after completion of work by MBE/WBE.

Facilities Planning

Physical Plant Building

360 Campus Center Way

Amherst, MA 01003

Certificate of Completion – Revised 10/01
PROJECT NO. _____________
UMA NO. _____________

FORM FOR TRANSFER OF TITLE (UMA 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 University of Massachusetts Amherst and receipt thereof is hereby acknowledged, do
hereby grant, sell, transfer, and deliver unto the said University of Massachusetts Amherst, 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 University of
Massachusetts Amherst 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 _____.

193
(Contractor or Subcontractor's Name)
By: ________________________________

Title: ________________________________
       hereunto duly authorized

UNIVERSITY OF MASSACHUSETTS AMHERST, 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 University of Massachusetts Amherst 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
University of Massachusetts Amherst 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 University of
Massachusetts Amherst.

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 accordance 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/Project Manager   (Date)
UNIVERSITY OF MASSACHUSETTS AMHERST
FACILITIES PLANNING
Physical Plant Building, 360 Campus Center Way,
Amherst, MA 01003

E-I CERTIFICATE OF

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FROM AWARDING AUTHORITY: University of Massachusetts Amherst

TO: General Contractor:

RE: UMA No.
    Project No.
    Title:
    Location:
AUTHORITY: M.G.L. c. 30, s. 39K; Article VI General Conditions of Contract

Pursuant to the authority noted above you are notified that the University of Massachusetts Amherst 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.)

The University of Massachusetts Amherst, through its undersigned representatives, hereby accepts from the Contractor, subject to Contract stipulations, 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 University of Massachusetts Amherst are attributable to the fault, negligence or oversight of the Contractor, his subcontractor, 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 University of Massachusetts Amherst 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, guarantees, indemnifications, insurance, or other items that are required by the Contract to survive the issuance of this certificate.

The undersigned recommend the issuance of this Certificate of Agency Use and Occupancy.

UMass Amherst Project. Manager:

Signature Date

By: ________________________________ ________
E-2 FINAL ACCEPTANCE

CERTIFICATE OF FINAL INSPECTION, RELEASE AND ACCEPTANCE

UMA. State Project No. <>; 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.

__________________________________________________________________________________________
Designer Authorized Signature Title 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.

2. Contract Award Price: $<> Adjusted Contract Price: $<>
   Authorized Additions: $<> Paid to Date: $<>
   Authorized Deductions $<> Balance Due: $<>  

3. 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 UMass Form 13.

   Request No.<> Date:<> Amount: $<>  
   Request No.<> Date:<> Amount: $<>  
   Request No.<> Date:<> Amount: $<>  

4. Subject to satisfactory disposition of Change Orders listed in Item 3 above, the undersigned releases the University of Massachusetts Amherst from all further claims for wages or payments to subcontractors or suppliers except:
   (list on attached sheet).

   by: ________________________________
   Contractor

   Authorized Signature: ________________________________

   The above entitled project is accepted as of ________________________________
   ________________________________

   Date

198
Part A. To be completed by governmental body, agency or IRC Section 501(c)(3) certified exempt organization

Exempt number

E 043 - 167 - 352

Contract number

Name of exempt organization

University of Massachusetts

Authorizing signature

[Signature]

Date

Director of Procurement

Part B. To be completed by purchasing contractor or subcontractor claiming exemption under MGL Ch. 64H, sec. 6(d), (e), (f) or (tt)

Purchaser [ ] contractor [ ] subcontractor

Address

Date

Vendor registration number (if applicable)

Contract/subcontract number

Contract/subcontract date

Estimated date of completion

Part C. To be completed by purchasing contractor or subcontractor claiming exemption. See instructions.

I claim the exemption corresponding to the box checked below, and certify as follows (check appropriate box below):

1. [ ] Exemption under MGL Ch. 64H, sec. 6(d) or (e): Contractor as Agent of Exempt Entity. I certify that the purchaser is a contractor or subcontractor engaged in the performance of a contract for the above described contract and that the purchaser is acting as an agent of one of the entities described below (check appropriate box) in purchasing tangible personal property (other than building materials and supplies described in MGL Ch. 64H, sec. 6(f)):

[ ] Governmental body or agency described in MGL Ch. 64H, sec. 6(d) (local public school, city/town government, state agency, etc.). Attach Form ST-2, Certificate of Exemption. If Form ST-2 is not available, enter agency's exemption number.

[ ] Tax exempt organization (under IRC Section 501(c)(3)) as described in MGL Ch. 64H, sec. 6(e) (parochial school, Scout troop, PTO, etc.). Attach Form ST-2, Certificate of Exemption. If Form ST-2 is not available, enter agency's exemption number.

To the best of my knowledge and belief, the quantities of tangible personal property noted on the reverse side are exempt from the sales/use tax under the provisions of MGL Ch. 64 H, sec. 6(d) or (e) as they are purchased by a purchaser acting as an agent for either a Massachusetts governmental body or for a tax-exempt organization under IRC section 501(c)(3).

2. [ ] Exemption under MGL Ch. 64H, sec. 6(f): Building Materials and Supplies. I certify that the purchaser is a contractor or subcontractor engaged in the performance of a contract for the construction, reconstruction, alteration, remodeling or repair of a building or structure for a governmental body or agency or for a certified IRC Section 501(c)(3) exempt organization or other project described in MGL Ch. 64H, sec. 6(f). To the best of my knowledge and belief, the described quantities of building materials and supplies noted on the reverse side are exempt from sales/use tax under the provisions of MGL Ch. 64H, sec. 6(f), and the described quantities of these materials and supplies are being purchased for use exclusively in the above contract.

3. [ ] Exemption under MGL Ch. 64H, sec. 6(tt): Consulting/Operating Contractor as Agent of Governmental Entity. I certify that the purchaser is a consulting or operating contractor or subcontractor as defined in MGL Ch. 64H, sec. 6(tt) and that the purchaser is authorized and acting as an agent of, and providing "qualified services," as defined in MGL Ch. 64H, sec. 6(tt), to a governmental body or agency described in MGL Ch. 64H, sec. 6(d). Attach Form ST-2. If Form ST-2 is not available, enter agency's exemption number. To the best of my knowledge and belief, the quantities of tangible personal property noted on the reverse side are exempt from the sales/use tax under the provisions of MGL Ch. 64 H, sec. 6(tt). The purchaser has been authorized under the above contract by a governmental body.

Regardless of the exemption claimed, I will maintain adequate records to show the disposition of all property purchased under this certificate. I understand that I am fully liable for the payment of any sales/use tax due in the event that the property purchased under this certificate is used in a non-exempt manner.

Signed under the penalties of perjury.

Signature

Title

Location and description of project and description of kind and quantity of property or receipts/invoices must be attached or noted on the back of this form. This form is approved by the Commissioner of Revenue and may be reproduced.
BID PACKAGE

PART IV

SUPPLEMENTARY GENERAL CONDITIONS

AND

SPECIFICATIONS

200
UMass Mullins Center and Garber Field
Video Boards
360 Campus Way
Amherst, MA 01003-9248

Project #: 1008489
UMA#: 17-06

ARCHITECT: GENSLER
SPECIFICATIONS: KALIN ASSOCIATES
AUDIO VISUAL DESIGNER: ANTHONY JAMES PARTNERS
STRUCTURAL ENGINEER: LIN ASSOCIATES, INC.
MEPFP ENGINEERS: ARUP USA, INC.
COST ESTIMATOR: VJ ASSOCIATES OF NEW ENGLAND, INC.

Gensler
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CONSTRUCTION SET
OCTOBER 7, 2016

Project Number 11.7074.000
THE UNIVERSITY OF MASSACHUSETTS
Design and Construction Management

SPECIFICATIONS FOR
UMA PROJECT NO. 1008489
UMASS MULLINS CENTER AND GARBER FIELD VIDEO BOARDS

GENSLER
Architect-of-Record

LIN ASSOCIATES INC.
Structural Engineer

ARUP USA INC.
HVAC Engineer

ARUP USA
Electrical Engineer

END OF SEALS

October 7, 2016
Construction Documents
# UNIVERSITY OF MASSACHUSETTS
## DESIGN AND CONSTRUCTION MANAGEMENT

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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. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of Article V of the CONTRACT AND GENERAL CONDITIONS.

1.2 REQUIREMENTS INCLUDED

A. Work under this Contract.
B. Examination of Site and Documents.
C. Contract Method.
D. Work Sequence.
E. Supervision of Work.
F. General Contractor’s Use of Premises.
G. Coordination.
H. Field Engineering.
I. Reference Standards.
J. Preconstruction Conference.
K. Project Meetings.
L. Permits, Inspection, and Testing Required by Governing Authorities.
M. Cutting, Coring, Patching, Unless Otherwise Indicated.
N. Debris Removal.
O. Field Measurements.
P. Emergency Procedures.
Q. Safety Regulations.
R. OSHA Safety and Health Course Documentation.
S. Damage Responsibility.
T. Owner Furnished Products.
U. Owner Occupancy.
V. Asbestos and Hazardous Materials Discovery.
W. Special Requirements.
X. List of Drawings.

1.3 WORK UNDER THIS CONTRACT

A. The work to be done under this contract consists of executing and completing all work required for Project # 1008489/ UMA 17-06 - UMass Mullins Center and Garber Field Video Boards.
1. Mullins Center:
   a. Demolition and removal of existing batten system and equipment.
   b. Provide new two-sided center hung video scoreboard and hoist lift system with associated steel frame and structural support steel.
   c. Demolish existing endzone scoreboard and signage, provide and install new endzone scoreboard and signage and anchoring steel.
   d. Provide all associated electrical, AV and communications per Drawings and specifications.
   e. Provide HVAC required for existing production room
   f. Provide lighting modifications to existing Mullins Center lightings per Drawings and specifications.

2. Garber Field: (AA-03 add alternate)
   a. Demolition of existing scoreboard and anchoring steel.
   b. Provide new scoreboard and audio system and anchor to existing steel support columns.
   c. Provide all electrical, AV and communications per drawings and specifications.

3. Installation of long-lead items procured by UMass Amherst as indicated on the Drawings.

B. Refer to Section 011001 - Event Schedule for no-work days and days where the site must be made available for UMA activities in the evening. UMA reserves the right to add 10 no-work days without additional cost to UMA.

C. The work will include all operations necessary to deliver the building(s) and ancillary on and off site amenities in a fully installed and operable condition including all utility and site work and obtaining all necessary licenses, permits, and certificates. Where utilities exist within and adjacent to the building(s) and ancillary parking lots, and are known by the Owner, they have been shown on the site plan(s) appearing in, but not restricted to, the exhibits. Connections to these existing utility lines will be the responsibility of the General Contractor.

D. The scope of work, without limiting the generality thereof, includes all labor, materials, equipment and services required to perform the work described fully in the Drawings and Specifications and includes, but is not limited to the following major work:

1. Construction of the Work indicated on the Drawings and as specified.

E. Reference To Drawings: The work to be done under this Contract is shown on the Drawings listed at the end of this Section.

F. Work will include all site removal and new construction for the UMass Mullins Center and Garber Field Video Boards including underground and overhead utilities, HVAC work, plumbing work, fire protection, and electrical work as required. The General Contractor will provide a schedule for completion of the project to the Owner within the required construction period.

1.4 EXAMINATION OF SITE AND DOCUMENTS

A. A pre-bid conference will be held at the job site on the date and at the time indicated in the Invitation to Bid.
B. Bidders shall visit the site during the pre bid conference, at the time specified in the advertisement and the bid documents. If allowed, bidders may visit on a non-holiday weekday acceptable to UMA Project Manager, between the hours of 9:00 AM and 3:00 PM to visually inspect the location of the work and existing conditions that may affect new work.

C. The bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which the work is to be carried out. UMA will not be responsible for errors, omissions, and/or charges for extra work arising from the General Contractors or Subcontractors failure to familiarize themselves with the contract documents. The General Contractor and Subcontractor acknowledge that they are familiar with the conditions and requirements of the contract documents where they require, in any part of the work a given result to be produced, and that the contract documents are adequate and will produce the required results.

D. Contact: The designer will be present at the pre bid conference. This will be the only time available for viewing the site; any further questions preceding the submission of the bid shall be directed to: Peter Royer by email: procurement@admin.umass.edu

E. No questions from Bidders will be accepted within 5 days of the Bid opening. Questions will be answered in the form of an addendum which will be posted to the Procurement website: http://www.umass.edu/procurement/constructionprojects.htm. Any information provided by other than the designated contact person identified above should be disregarded in the preparation of Bids.

1.5 CONTRACT METHOD

A. Work under this contract shall be lump sum price, for the scopes of work as described in these specifications and shown on the Drawings.

1.6 WORK SEQUENCE

A. The Work will be conducted in the following sequence of demolition/construction:

1. Phase 1: Demolition and removal of existing batten system and equipment. Provide associated electrical, AV and communications per drawings and specifications. Provide and install HVAC required for existing production room.
2. Phase 2: Provide new two-sided center-hung video scoreboard and hoist lift system with associated steel frame and structural support steel. Demolish existing endzone scoreboard and signage. Provide new endzone scoreboard and anchoring steel. Provide remaining associated electrical, AV and communications per Drawings and specifications. Provide lighting modifications to existing Mullins Center lighting per Drawings and specifications.
3. Phase 3: Garber field scoreboards and audio systems.

1.7 SUPERVISION OF WORK

A. The General Contractor shall be held directly responsible for the correct installation of all work performed under this Contract. The General Contractor must make good repair, without expense
to the Commonwealth, of any part of the new work, or existing work to remain, which may become inoperative on account of leaving the work unprotected or unsupervised during construction of the system or which may break or give out in any manner by reason of poor workmanship, defective materials or any lack of space to allow for expansion and contraction of the work during the General Contractor's warranty period, from the date of final acceptance of the work by the University of Massachusetts Amherst (UMA).

B. The General Contractor shall furnish a competent Massachusetts licensed superintendent satisfactory to the UMA Project Manager and to the Designer. The licensed superintendent shall supervise all work under this contract and who shall remain on duty at the site throughout the Contract period while work is in progress.

1. Submit the name and resume of the superintendent for approval to the UMA Project Manager. Include experience with projects of equal size and complexity.

1.8 GENERAL CONTRACTOR’S USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated within the construction fence shown on the site drawing(s). Coordinate work of all Subcontractors required outside the construction fence boundary shown on the site drawing(s). Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public (if applicable).
2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner’s employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
3. Areas outside the Construction Fence or Immediate Work Area: The Contractor is responsible for clean-up of all debris, dirt and sediment resulting from the construction work.

B. Schedule and perform work to afford minimum of interruption to normal and continuous operation of utility systems. The General Contractor shall submit to UMA and the Designer for approval, proposed schedule for performing work; including construction of new utilities, re-routing of existing utilities and final connection of new work to existing work. Schedule shall indicate shutdown time required for each operation.

1. Work includes checking all safety devices to verify that they have come back on-line after interruption. This requirement will not be waived.

C. The General Contractor shall schedule as per Section 015000 - Temporary Facilities and Controls, the shutting down or interrupting any utilities, services or facilities which may affect the operation of the building outside the area of work or other buildings, services or facilities of the UMA.

D. Coordinate with UMA and the Designer, work in connection with adjacent driveways, walks, or other facilities which would prevent access thereto or interrupt, restrict, or otherwise infringe upon the Operating Agency’s use thereof.
E. The General Contractor shall be aware of the sensitivity of the neighborhood organizations to noise, dust, debris, vibration, and site maintenance and take appropriate precautions to avoid conflict.

F. Damage to existing work, if caused by the General Contractor’s operations under this Contract, shall be repaired at the General Contractor's expense.

1. An existing conditions survey shall be conducted, with the Designer, the UMA Project Manager, and UMA representatives, at which existing conditions will be videotaped by the General Contractor. A copy of the videotape will be provided to the UMA Project Manager.

G. Trenching and other work outside construction limits shall be expedited to fullest extent and carried out with minimum of inconvenience to normal operation of the Operating Agency and public traffic. Walks, paved or landscaped areas over which temporary driveways cross, shall upon completion of the work, be restored to their original condition. Temporary roadways shall be bridged over trenched areas. Filing is required for a UMA issued trench permit.

H. The General Contractor can gain access to the premises during the hours specified below. In addition the General Contractor and his personnel will limit themselves only within the working premises during working hours. If work needs to be scheduled during times other than those listed below, General Contractor shall inform the UMA Project Manager one week prior to work.

1. Deliveries: 7:00 AM to 6:00 PM.
2. General Access: 7:00 AM to 6:00 PM during the regular work week.

I. Confine operations at the site to areas permitted by:

1. Laws
2. Ordinances
3. Permits
4. Contract Documents
5. Owner’s Regulations

J. If required by UMA or the UMA Project Manager, workers will be required to wear identifying name badges. In secure areas, submit names of workers for clearing by the UMA Project Manager.

K. General Contractor shall supervise the use of the site related to construction and be responsible for correcting any damage identified by the UMA Project Manager to the UMA Project Manager’s satisfaction.

1. An existing conditions survey shall be conducted, with the Designer, The UMA Project Manager, and UMA representatives, at which existing conditions will be videotaped by the General Contractor. A copy of the videotape will be provided to the UMA Project Manager.

L. All available existing utilities adjacent to the construction site will be available for use during construction unless indicated otherwise. Temporary connections to these utilities, all metering,
transformers, removal, usage, and their associated costs will be the responsibility of the appropriate Subcontractor.

1. Utilities Available for use During Construction: ((Designer to provide list after verifying availability with UMA)).

M. The General Contractor shall verify that Subcontractors have visited the site and included all costs associated with the location of the project, and any restriction or limitations the location of the project may pose.

N. The Subcontractors shall at all times conduct their operations in a courteous, professional manner while on the project or in the vicinity of the project. Harassment, offensive language or behavior will not be permitted on the site.

O. The University of Massachusetts, Amherst can neither accept nor assume responsibility for the security of the Contractor's material or equipment which is lost, stolen or vandalized. The Contractor is advised to exert caution in placement and storage of his equipment and material.

P. Parking: Parking spaces on Campus are very limited and the University will not provide designated parking lot spaces near the construction site for the Contractor’s use. The Contractor shall contact Parking Services (545-0065) to determine the location of the nearest available parking spaces. The Contractor will be required to pay all fees for parking. The Contractor shall state his/her parking and staging area requirements during the Pre-construction Meeting. The area(s) for materials storage will then be agreed to between the Contractor and the UMA Project Manager. The limits of material storage will be delineated by the Contractor with construction fencing and enforced throughout the Contract. Refer to Section 015000 - Temporary Facilities and Controls for additional requirements.

Q. Areas not to be used for storage include the areas under the “drip line” of trees, planting beds, and sidewalks. Install temporary fencing around the drip line of trees and protect vegetation from construction damage. Restoration of the delineated parking and storage area shall be as described in Section 017700 – Contract Closeout. Trailers or storage piles shall not be located over utility lines or their access points.

R. Radios, tape players, “boom boxes”, or other audio entertainment equipment, including personal entertainment devices, shall not be allowed on the project site.

S. The University of Massachusetts prohibits tobacco use everywhere on campus, inside buildings and throughout the grounds. This policy applies to everyone and anyone on campus, including students, staff, faculty, contractors, and visitors. For the purpose of this policy, ‘tobacco’ refers to any and all tobacco products, whether inhaled or ingested, as well as electronic cigarettes.

1. The use of tobacco is prohibited in all buildings and vehicles owned or leased by UMass Amherst, regardless of location.
2. The use of tobacco is prohibited on all University grounds and in any outdoor area controlled by the University. This includes all University land, parking lots and parking ramps, athletic fields, tennis courts, and recreational areas.
3. The use of tobacco is prohibited inside any vehicle located on University grounds.
4. When any person enters the grounds of the University, any smoking material shall be extinguished and disposed of in an appropriate receptacle at the perimeter of the grounds of the University.
T. The Contractor shall not allow the use of intoxicating beverages or non-prescription controlled substance drugs upon or about the work site.

U. The Contractor shall provide and maintain in good serviceable condition at all times, warning signs and non-combustible barriers, forms and fire resistive tarps or plastic, each of which shall be approved by the University, shall be suitable for the purpose, and shall be installed adjacent to each work area, for complete enclosure and/or isolation of all excavations, wells, pits, manholes, shafts, overhead areas, etc., which are associated with the work under the contract. Barriers shall be a secure fence, guardrail, cover, or similar assembly designed and erected to provide protection for concrete, protection from the weather, and to prevent accidental access. Barrier tape and/or sawhorses shall not be used as a means of such access protection.

1.9 COORDINATION

A. The General Contractor shall be responsible for the proper fitting of all the work and for the coordination of the operations of all Subcontractors or material and persons engaged upon the work. The General Contractor shall do, or cause his agents to do, all cutting, fitting, adjusting, and repair necessary in order to make the several parts of the work come together properly.

1. Examine Contract Documents in advance of start of construction and identify in writing questions, irregularities or interference to the UMA Project manager in writing. Failure to identify and address such issues in advance becomes the sole responsibility of the General Contractor. A conflict that would cause the reduction of the normal ceiling height of any occupied space is considered to be an interference.

B. Execute the work in an orderly and careful manner with due regard to the occupants of the facility, the public, the employees, and the normal function of the facility.

C. The work sequence shall follow planning and schedule established by the General Contractor as approved by the Designer and the UMA Project Manager. The work upon the site of the project shall commence promptly and be executed with full simultaneous progress. Work operations which require the interruption of utilities, service, and access shall be scheduled so as to involve minimum disruption and inconvenience, and to be expedited so as to insure minimum duration of any periods of disruption or inconvenience.

D. The General Contractor shall review the tolerances established in the specifications for each type of work and as established by Subcontractor organizations. The General Contractor shall coordinate the various Subcontractors and resolve any conflicts that may exist between Subcontractor tolerances without additional cost to UMA. The General Contractor shall provide any chipping, leveling, shoring or surveys to ensure that the various materials align as detailed by the Designer and as necessary for smooth transitions not noticeable in the finished work.

1.10 FIELD ENGINEERING

A. Provide field engineering services; establish grades, lines and levels, by use of recognized engineering survey practices. All field engineering surveying shall be performed by a licensed Land Surveyor registered in the Commonwealth of Massachusetts.
B. The General Contractor shall survey and submit exact dimensional layouts as required. Engage and pay for the services of a Massachusetts Registered Surveyor acceptable to the UMA Project Manager to locate and protect control and reference points.

1.11 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements for the standard, except where more rigid requirements are specified or are required by codes. Refer to Section 014200 - REFERENCES.

B. Where reference is made in the Contractual Documents to Publications and Standards issued by Associations or Societies, the intent shall be understood to specify the current edition of such Publications or Standards (including tentative revision) in effect on the date of the contract advertisement notwithstanding any reference to a particular date.

1.12 PRE-CONSTRUCTION CONFERENCE

A. In accordance with Article V of the CONTRACT AND GENERAL CONDITIONS, a pre-construction conference to review the work will be conducted by the UMA Project Manager.

B. Representatives of the following shall be required to attend this conference:

1. UMA
2. Designer
3. General Contractor
4. All Subcontractors
5. Applicable Municipal Agencies

C. The General Contractor shall have a responsible representative at the pre construction conference to be called by the UMA Project Manager following the award of the contract, as well as representatives of field or office forces and major Subcontractors. All such representatives shall have authority to act for their respective firms. The pre-construction conference is to be held within five days of Notice to Proceed, or as otherwise determined by UMA.

D. Contact List: The Contractor shall provide to the Designer and UMA Project Manager a list containing the following:

1. Contractor’s name, address, office and cell phone number, fax number, e-mail address and after hours emergency phone number.
2. Contractor’s Superintendent name email address and cell phone number.
3. Each Sub-Contractor’s name, email address, address, office and cell phone number, fax number and description of the products or services they will provide to the project.

E. Agenda: Discuss items of significance that affect progress, including the following:

1. Tentative construction schedule.
2. Phasing.
3. Critical work sequencing.
4. Designation of responsible personnel. The Contractor shall identify a contractor safety representative to interface with the University Construction Safety Officer (CSO). This person may also fill other roles within the contractor’s project area e.g. project manager, superintendent, foreman, etc.
5. Procedures for processing field decisions and Change Orders.
6. Procedures for processing Applications for Payment.
8. Submittal procedures.
9. Preparation of Record Documents.
10. Use of the premises.
11. Safety. The UMA CSO will attend the pre-construction meeting for the purpose of orienting the contractor to policies specific to the University, discuss the contractor’s site specific safety plan, as well as to emphasize recognized safety practices expected on campus. The Contractor Safety Representative is responsible to ensuring this information is disseminated to all contractor/ subcontractor employees. If the UMA CSO is unable to attend, the UMA CSO may send a designee to cover this portion of the meeting or the UMA CSO and UMA Project Manager will schedule a separate time when this review may be completed.
12. Responsibility for temporary facilities and controls.
14. Office, work, and storage areas.
15. Equipment deliveries and priorities.
16. First aid.
18. Progress cleaning.
19. Working hours.
20. Emergency phone numbers.
21. Payment procedures and Schedule of Values.
22. Material deliveries.

F. Reporting: Minutes of the meeting shall be prepared by the Designer or designated representative and shall be distributed to each party present. The General Contractor shall be responsible for distributing the minutes to all Field-Sub Contractor

1.13 PROJECT MEETINGS

A. Project meetings shall be held on a weekly basis and as required subject to the discretion of the UMA Project Manager.

B. Attendees: In addition to the U.M.A. Project Manager and Designer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

C. 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.
1. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to
Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

2. Review present and future needs of each entity present, including the following:
   a. Interface requirements.
   b. Sequence of operations.
   c. Status of submittals.
   d. Deliveries.
   e. Off-site fabrication.
   f. Access.
   g. Site utilization.
   h. Temporary facilities and controls.
   i. Manpower.
   j. Hazards and risks.
   k. Progress cleaning.
   l. Quality and work standards.
   m. Change Orders.
   n. Documentation of information for payment requests.

D. As a prerequisite for monthly payments, ordering schedules, shop drawing submitted schedules, and coordination meeting schedules shall be prepared and maintained by the General Contractor and shall be revised and updated on a monthly basis, and a copy shall be submitted to the UMA Project Manager and Designer.

E. In order to expedite construction progress on this project, the General Contractor shall order all materials immediately after the approval of shop drawings and shall obtain a fixed date of delivery to the project site for all materials ordered which shall not impede or otherwise interfere with construction progress. The General Contractor shall present a list and written proof of all materials and equipment ordered (through purchase orders). Such list shall be presented at the meetings and shall be continuously updated.

F. Scheduling shall be discussed with all concerned parties, and methods shall be presented by the General Contractor, which shall reflect construction completion not being deferred or foreshortened. Identify critical long-lead items and other special scheduling requirements. The project schedule is to include time for submission of shop drawing submittals, time for review, and allowance for resubmittal and review.

G. Project meetings shall be chaired by the Designer.

H. Minutes of the project meetings shall be prepared by the Designer and shall be distributed to all present. The Designer’s meeting minutes shall be the only official meeting record. Minutes shall enumerate each topic item, and each topic shall be updated at each progress meeting. Actions to be taken for each topic shall be recorded, along with identification of the party responsible for each action item. Items shall not be removed from the Minutes until all issues with each item have been resolved.
1.14 PERMITS, INSPECTION, AND TESTING REQUIRED BY GOVERNING AUTHORITIES

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having any jurisdiction require any portion of the Work to be inspected, tested, or approved, the General Contractor shall give the Designer, the UMA Project Manager or his/her designated representative, and such Authority timely notice (5 business days minimum) of its readiness so the Designer may observe such inspecting, testing, or approval.

B. Prior to the start of construction, the General Contractor shall complete application to the applicable Building Code enforcement authority for a Building Permit. Such Permit shall be displayed in a conspicuous location at the project site. The building permit fee shall be paid by the Contractor.

C. Unless otherwise specified under the Sections of the Specifications, the General Contractor shall pay such proper and legal fees to public officers and others as may be necessary for the due and faithful performance of the work and which may arise incidental to the fulfilling of this Contract. As such, all fees, charges, and assessments in connection with the above shall be paid by the General Contractor.

D. The General Contractor shall maintain at the site, for the duration of construction operations, at least one (1) up-to-date copy of all relevant codes and standards listed in the Contract Documents or determined to be applicable to the work. One (1) copy of such codes shall be for the exclusive use of UMA and the Designer and its Consultants, and shall be kept in the General Contractor’s site office.

E. The General Contractor shall furnish and install all information required by the building official and shall secure the general building permit for the work promptly on award of the Contract. The General Contractor shall conform to all conditions and requirements of the permit and code enforcement authority. The General Contractor shall provide names and license numbers of its responsible representatives to complete the application for permit, and shall receive the permit and promptly distribute copies to UMA and the Designer.

F. General Contractor and specialized Subcontractors as applicable shall identify all permits (other than general building permit) required from Authorities having jurisdiction over the Project for the construction and occupancy of the work. The General Contractor shall prepare the necessary applications and submit required plans and documents to obtain such permits in a timely manner, and shall furnish the required information to the Building Official and obtain the required permits as early as practicable after award of the Contract.

1. The General Contractor shall display all permit cards as required by the Authorities, and shall deliver legible photocopies of all permits to UMA’s Project Manager and the Designer promptly upon their receipt.

2. The General Contractor shall arrange for all inspections, testing and approvals required for all permits, and shall notify the Designer and UMA’s Resident Engineer of such inspections at least three (3) business days in advance (longer if so required in the various Sections of the Specifications), so they may arrange to observe.

3. The General Contractor shall comply with all conditions and provide all notices required by all permits.

4. The General Contractor shall perform and/or arrange for and pay all testing and inspections required by the Governing Codes and Authorities, other than those provided by UMA, and shall notify the Designer and UMA’s Resident Engineer of such
inspections at least three (3) business days in advance of all such testing or inspection, so they may arrange to observe.

5. Where Inspecting Authorities require corrective work for conformance with applicable Codes and Authorities, the General Contractor shall promptly comply with such requirements, except in cases where such requirements clearly exceed the requirements of the Contract Documents, in which case the General Contractor shall proceed in accordance with the procedures for modifications or changes in the work established in the Contract Documents, as amended.

G. Prior to the start of construction, the General Contractor shall complete applicable applications, permits, and notifications to the MADEP, such as the Demolition/Construction form BWP AQ-06, and the asbestos notification form ANF-001, and pay the required fees. These forms must be submitted at least 10 working days in advance of any regulated activity on the site. Demolition permits must be submitted for any work involving demolition, new construction and renovation. The University EHS office must be provided copies of any and all notifications.

H. Building permits are required for the installation of office trailers. Trailers must be securely anchored to prevent displacement due to wind.

I. Metal dumpsters of 6 cubic yard aggregate capacity or more, and containing combustible materials, must have a Local Fire Department Permit issued for each location. If the containers are delivered and removed on the same day, no permit is required (527 CMR 34.03).

J. Storage of more than 2500 cubic feet gross volume of combustible or flammable materials in a building will require a permit from the Local Fire Department.

K. Use and storage of more than 10 gal or 42 lbs of Liquefied Propane Gas (LPG) containers on site must be approved by and a permit must be secured through the local Fire Department.

L. Any work involving existing fire protection systems or related equipment (fire alarm, sprinkler, fixed extinguishing system) will require the Contractor to obtain a permit from the local Fire Department. Any work that affects Fire Protection Systems shall require the Contractor to notify the U.M.A. Environmental Health and Safety Department. Any work which disables part or all of a fire protections system for more than 8 hours shall submit an impairment plan to the UMA Project Manager, and EH&S.

M. The Contractor is required to obtain trenching permits from UMA EH&S for any excavations or trenches that are greater than 36 inches in depth three working days prior to start of work.

N. The General Contractor shall be required to keep a copy of the State Building Code (with latest amendments) at the job site at all times.

O. Any construction sites disturbing greater than one acre require a notice of intent to the EPA, and will require a written a stormwater pollution prevention plan. A Notice of Termination must then be filed when sediment controls are no longer required.

1.15 CUTTING, CORING, AND PATCHING, UNLESS OTHERWISE INDICATED

A. The General Contractor shall coordinate all cutting, coring, fitting and patching of the work that may be required to make its several parts come together properly and fit it to receive or be
received by work of the Subcontractors shown on the Drawings and Specifications. The Subcontractor shall perform all cutting, coring or patching.

B. The General Contractor shall coordinate that the work of the Subcontractor is not endangered by any cutting, coring, excavating, or otherwise altering of the work and shall not allow the cutting or altering the work of any Subcontractor except with the written consent of the Designer.

C. Submit a written request to Designer at least three (3) business days in advance of executing any cutting or alteration which affects:

1. Work of UMA or separate Contractor.
2. Structural value or integrity of any element of the Project.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance, or safety of operational elements.
5. Visual qualities of sight-exposed elements.
6. Request shall include:
   a. Identification of the Project.
   b. Description of affected work.
   c. The necessity for cutting, alteration, or excavation.
   d. Effect on work of UMA or any separate General Contractor, or on structural or weatherproof integrity of Project.
   e. Description of proposed work:
   f. Alternatives to cutting and patching.
   g. Cost proposal, when applicable.
   h. Written permission of any separate General Contractor whose work will be affected.
7. Should conditions of Work or the schedule indicate a change of products from original installation, General Contractor shall submit request for substitution.
8. Submit written notice to Designer designating date and time the work will be uncovered a minimum of three business days in advance.

D. Performance:

1. Execute cutting and patching by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
   a. In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
   b. Prior to cutting and structural steel or concrete work, contact Designer and Project Structural Engineer in writing. Do not cut any structural steel and concrete work until approval has been granted by the Designer and the Project Structural Engineer.
2. Employ original installer or fabricator to perform cutting and patching for:
   a. Weather-exposed or moisture-resistant elements.
   b. Sight-exposed finished surfaces.
3. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
4. Restore work which has been cut or removed; install new products matching existing to provide completed Work in accordance with requirements of Contract Documents.
5. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
6. Patch with seams which are durable and as invisible as possible. Flash and seal all penetration of exterior work. Comply with specified tolerances for the work.

7. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.
   a. Where patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch.

8. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
   a. For continuous surfaces, refinish to nearest intersection.
   b. For an assembly, refinish entire unit.

E. Existing Utilities Services:
1. Interruptions to critical existing utility services will not be allowed except as scheduled per Section 015000 - Temporary Facilities and Controls.
   a. Sanitary sewer, storm drainage, and water changeovers as affecting existing services shall be done with no disruptions of existing services and scheduling of such work will require approval in writing by the UMA.
   b. All relocation of existing electrical, telephone, and gas services that are utility company owned shall be performed by the respective utility company, and the cost of any charges for such work shall be paid by the General Contractor. All utility installations and relocation shall be the responsibility of the General Contractor. Coordination of all of the aforesaid work is the responsibility of the General Contractor.
2. The General Contractor shall locate and record on Drawings all existing utilities along the course of the work by such means as the Designer and the UMA Project Manager may approve, and shall preserve such marked locations until the work has progressed to the point where the encountered utility is fully exposed and protected as required. It shall be the General Contractor’s responsibility to notify the proper authorities and/or utility company before interfering therewith.
3. Existing utilities that are indicated on the Drawings or whose locations are made known to the General Contractor prior to excavations, though accuracy and information as to grades and elevations may be lacking, shall be protected from damage during the excavation and backfilling operations and, if damaged by the General Contractor, it shall be repaired by the General Contractor at his/her own expense.
4. All exposed conduits, wires, and/or cables shall be provided with sufficient protection and support to prevent failure, fraying, or damage due to backfilling or other construction operations.
5. The General Contractor shall not obstruct access to existing active utility system manholes and catch basins which continue to serve facilities other than the project construction site. The General Contractor shall exercise measures as necessary to prevent the placement of impediments that limit continuous access by authorized utility company or UMA maintenance personnel and shall be required to reimburse the utility company or UMA for any expense incurred as a result of need to remove any such impediments to access.

F. Dig-Safe:
1. If excavation, staking or any other scarifying existing grade to a depth greater than 6 inches is required, the Contractor shall follow the standard DIG-SAFE procedures as described in Massachusetts General Laws (CMMR 82:Section 40). Contractor shall review the following procedures with the UMA Project Manager prior to initiating DIG-SAFE procedures to insure that there have not been changes.
2. The Contractor shall pre-mark all areas to the full extent of proposed excavation(s) with white paint. Use fluorescent pink paint when snow cover is present. Maintain complete visibility of paint for entire DIG-SAFE period.

3. After marking the site, apply for a DIG-SAFE permit on-line through UMA Physical Plant, website: http://www.umass.edu/physicalplant/index.html.

4. After marking the site, and at least 7 days before an excavation, the Contractor shall notify DIG-SAFE by calling 811 or online at http://www.digsafe.com.

5. On the same day as the DIG-SAFE request is made, the Contractor shall deliver to the Physical Plant DIG-SAFE Coordinator (Tel. No. 413-545-4903) a site plan indicating the DIG-SAFE Quick-Ticket Number and displaying all relevant areas and pre-marked limits of the proposed excavation(s).

6. If the Contractor is informed of issues regarding the proposed excavation, the Contractor shall resolve those issues to the satisfaction of the UMA DIG-SAFE Coordinator. Issues that may require changes in the project design shall be brought to the attention of the Designer and UMA Project Manager immediately for resolution. If no issues are raised by the DIG-SAFE Coordinator that require the design of the project to change, the Contractor may proceed with the proposed excavation(s) commencing seven (7) working days after submission of the site plan and Quick-Ticket Number to the DIG-SAFE Coordinator.

7. Prior to the “Dig-Safe” notification, the Owner requires General Contractors to provide their Superintendent with current “Dig-Safe” regulations, and a copy of Massachusetts General Laws, Chapter 82, Section 40.

1.16 DEBRIS REMOVAL

A. The General Contractor shall coordinate the removal of all demolition and construction waste by the Subcontractor from the job site on a daily basis. Waste shall be segregated for recycling. Comply with requirements of Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

B. Debris shall be legally disposed of in a D.E.P. approved disposal site. The site to be used shall be submitted to and approved by the UMA Project Manager prior to the start of construction. All required dumping permits shall be obtained prior to start of construction. General Contractor shall submit receipts from the disposal site(s) as evidence of legal disposal. The Subcontractor shall pay the cost of any charges for debris removal.

C. The General Contractor shall bear responsibility for maintaining the building and site clean and free of debris, leaving all work in clean and proper condition satisfactory to UMA and the Designer. The General Contractor shall ensure that each of the Subcontractors clean up during and immediately upon completion of their work. Clean up includes the following tasks:

1. Remove all rubbish, waste, tools, equipment, appurtenances caused by and used in the execution of work.

D. Prevent the accumulation of debris at the construction site, storage areas, parking areas, and along access roads and haul routes.

E. Provide containers for deposit of debris and schedule periodic collection and disposal of debris.

F. Prohibit overloading of trucks to prevent spillage on access and haul routes.
G. The General Contractor shall be responsible for proper disposal of all construction debris leaving the site.

1.17 FIELD MEASUREMENTS

A. Although care has been taken to ensure their accuracy, the dimensions shown for existing items and structures are not guaranteed. It is the responsibility of the General Contractor to verify these dimensions in the field before fabricating any construction component. No claims for extra payment due to incorrect dimensions will be considered by the Commonwealth.

1.18 EMERGENCY PROCEDURES

A. The Contractor shall thoroughly familiarize himself (review with U.M.A. Project Manager, E.H. & S., and Public Safety) with U.M.A. Emergency Procedures and inform all subcontractors of same. Note that on campus:

B. Dialing “911” may reach Amherst Police or UMass Police depending on the phone used. Therefore, always identify your location as being as UMass Amherst including the project/building address and/or names of adjacent roads and or buildings.

C. Dialing 5-2121 on a campus phone or 413-545-2121 on an outside phone reaches the UMass Police (General Business). UMass Police can facilitate obtaining necessary services for the emergency.

D. Emergencies: In the event of an emergency on-site, telephone for emergency services (ambulance, fire department or police assistance)

E. Telephone for Emergency Service (See 1.20A above)

F. Call 911 or 545-2121 and inform them if confined space rescue equipment is required or if hazardous material is involved.

G. If live steam, electricity, or other utilities need to be shut off, call the U.M.A. Physical Plant switchboard (545-0600) and ask them to contact the appropriate shop.

H. If live steam, electricity, or other utilities need to be shut off, call the U.M.A. Physical Plant switchboard (545-0600) and ask them to contact the appropriate shop.

I. Make the scene safe.

J. Render First-Aid if possible.

K. Preserve evidence.

L. Call the UMA Project Manager.

M. Call the UMA Project Manager and UMA EH&S (413-545-2682) for significant incidents/injuries beyond first aid, including situations that have the potential to cause significant personal injury or damage to UMass property. All spills of hazardous materials
regardless of quantity shall be reported to EH&S. The University EHS office is responsible for notifying MADEP if appropriate, and any necessary outside responders, unless the contractor has specified their own responder.

N. Contact the appropriate outside agencies as required by law, including OSHA for fatalities or injuries requiring hospitalization of three or more individuals (by Contractor). All regulatory notifications required for environmental events shall be made by UMA EH&S. Contractors shall report any incident involving a radiographic source to UMA EH&S, the Mass Dept of Public Health (DPH) and The US Nuclear Regulatory Commission (NRC). Ensure the UMA EHS office is contacted as well for any of these circumstances.

1.19 SAFETY REGULATIONS

A. This project is subject to compliance with Public Law 91 596 "Occupational Safety and Health Act" latest edition (OSHA 29 CFR 1926), 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. Submit the name of the General Contractor's safety officer to the UMA Project Manager. Submit copies of safety reports to the UMA Project Manager monthly.

C. Each Contractor/ subcontractor will be responsible to submit a written Safety Program, prior to starting construction, outlining measures they take to cover their operations and protect their employees. Construction Projects will also submit a Site Specific Safety Plan specific to their operations at the University and which address their plan of action for identified and potential environmental, health and safety issues that may arise prior to start of construction. Maintain a written hazard communication program in accordance with OSHA 29CFR 1910.1200. Keep MATERIAL SAFETY DATA SHEETS (MSDS) on site and upon request provide MSDS sheets for materials used in the construction.

D. All accident reports are to be transmitted to the Resident Engineer within 24 hours of occurrence.

E. The Contractor shall immediately notify UMA EH&S if an OSHA, DEP or EPA regulator visits the site.

F. UMA and EH&S personnel shall have the authority to exercise on-site compliance audits on the construction site. Deficiencies discovered during site inspections and visits will be relayed to the contractor’s company safety representative and the UMA Project Manager. The contractor will communicate back to the UMA Project Manager and Environmental Health and Safety on the course of corrective action to be taken and the timeline for completion. If during such an audit, in his or her professional opinion, there exists an imminent danger or serious violation of established environment, health and safety standards that could lead to death or serious physical harm, damage to university property or the environment, the University representative has the right to request the immediate halt of such operations.

G. Hazardous Waste Generation: Any work generating Hazardous or so-called Universal Wastes will comply with all requirements of 310 CMR 30.000. The proper storage, use and disposal of any hazardous chemicals or substances brought on site by the Contractor are the responsibility...
of Contractor. The University will not be responsible for any hazardous materials left on site, the cost to remove these materials will be the Contractor’s responsibility. All hazardous wastes generated as a result of demolition and remodeling shall be contained, collected, segregated, labeled per all applicable federal EPA, Massachusetts DEP, and Federal DOT regulations or other applicable local, state or federal hazardous waste regulations, pending the appropriate disposition. Contractor shall provide for properly packaging hazardous waste, preparing the proper shipping papers, identifying a permitted disposal site, and contacting EH&S at least 24 hours prior to shipment of the waste. EH&S will review the hazardous waste shipment and sign the paperwork. EH&S must keep the “Generator” copies of the manifest on file in the EH&S office.

H. The contractor must inform EH&S if they intend to store any type of oil in 55 gallons or larger quantities so that such storage can be included in the UMass SPCC plan, this includes oil for equipment, form oil, cutting oil, diesel, gasoline, etc. Spills of any oil outside to soil, water or ambient air shall be reported to EH&S. Oil is also considered to be a hazardous waste in the state of MA when it is disposed. All waste oil must be managed in accordance with the hazardous waste section of this document.

I. Non Destructive Testing: The Contractor shall notify the U.M.A. Project Manager and the Environmental Health and Safety Department 3 days prior to the use of a radiography or x-ray equipment. The Contractor shall demonstrate safety procedures acceptable to the University and also provide sufficient personnel to maintain the safety zone perimeter as required by code. UMA EHS must be contacted to review all radiography to be performed on campus property before it takes place. In the event of a failed source, it is the contractor’s responsibility to recover a damaged radiography source, moisture density gauge or other radioactive source used in the construction industry and to decontaminate any soil, equipment or other university property contaminated by a failed source.

J. Any salamanders used must exhibit an approval tag from the Massachusetts State Fire Marshal and any Contractor intending to utilize a salamander shall meet the requirements of 527CMR 20 and obtain a permit from the local Fire Department.

K. All Hot Works, including cutting, welding, brazing, etc., requires a permit from the UMA Environmental Health and Safety Dept. (EH&S), located at Draper Hall, (545 2682). A Hot Works permit is not required for work performed outside (unless it is in a temporary enclosure such as a tent). Contractor must provide a minimum of one operable fire extinguisher approved by a recognized testing laboratory and rated for the intended purpose near each Hot Work operation. At least one employee of the contractor shall remain on the site for one hour after the hot work has ceased to ensure against the outbreak of fire.

L. Use of Liquefied Propane Gas (LPG) and containers on site must be approved by and a permit must be secured through the local Fire Department.
   2. Contractor must provide a minimum of one operable 20 BC rated fire extinguisher approved by a recognized testing laboratory near each LPG operation.

M. Use of torches or other flame producing devices for the removal of paint from buildings, or the application or removal of roofing materials must conform with the State Fire Marshal's regulations (527 CMR 10.24).
   1. Permit must be secured through the local Fire Department and UMA EH&S.
2. An approved and operable fire extinguisher must be kept in the work area.
3. At least one (1) workman must remain at the work area for (1) hour after the use of the torch or flame producing device has ceased.

N. Contractors performing work in buildings that will cause smoke or dust particles to become airborne must first check for the existence and location of heat or smoke detectors and other types of fire protection system equipment which may be affected by the work. The contractor shall request isolation or deactivation of such equipment through the UMA Project Manager. Such isolation, deactivation and notification shall occur prior to commencing work. Upon completion of the work, the contractor shall request reactivation of such equipment through the Project Manager. UMA EH&S may require that smoke detectors be bagged on a daily basis if smoke or dust particles may affect them. In this event bags must be removed at the end of the day. Notify the U.M.A, Environmental Health and Safety Fire Prevention officer prior to isolation or deactivation of such equipment.

O. All construction will comply strictly with the Massachusetts State Building Code Article 30 (780 CMR 30): Required fencing, sidewalk sheds, storage of flammables, portable fire extinguishers, fire standpipe operation and rubbish removal will be enforced by Environmental Health & Safety.

P. Tar kettle usage must strictly conform to 527 CMR 10.03(12), including: (Designer shall delete this item if tar kettle will not be used on the project)
1. No kettle usage allowed in buildings or on roofs.
2. Kettles must be attended at all times.
3. Kettles must be placed away from buildings and exitways.
4. Kettles must be equipped with tight fitting covers.
6. Propane fired units must be secured against vandalism.
7. One 60 BC rated fire extinguisher must be within 30 feet of the kettle.
8. One 60 BC rated fire extinguisher must be on roof for roofing operations.

Q. Confined Space Requirements:
1. Permit Required Confined Spaces, (PRCS). If work under this Contract specifically or incidentally requires this Contractor or any of his Sub-Contractors to enter spaces that are meeting the definition provided in 29 CFR 1926 Subpart AA (1926.1200-1926.1213) of a “Permit Required Confined Spaces”, it shall be the responsibility of the Contractor entering the space to have in place a Permit Required Confined Space Entry Program that meets OSHA 29 CFR 1926 Subpart AA (1926.1200-1926.1213) requirements. No entry shall be made without the permit. UMass requires that confined spaces encountered in construction projects be evaluated and entered in accordance with 29 CFR 1926 Subpart AA (1926.1200-1926.1213) UMA will provide information known about the space to the controlling contractor per 1926.1203(h). No entry will be made into a UMA Utility Manhole without first coordinating with the applicable UMA Utility Department.
2. The Facilities & Campus Services Solution Center must be notified each time prior to personnel entering and each time after personnel exit a utility manhole or tunnel.
3. It is also the responsibility that any work performed under this contract in PRCS’s be performed in strict compliance with the contractor’s own PRCS/OSHA Policy.
4. At the conclusion of any work in a PRCS, the General Contractor shall debrief the Project Manager and provide copies of the documentation required under the Contractor’s PRCS Policy.
5. If University personnel must enter the PRCS along with a contractor, a separate UMass Permit will be used for UMass Personnel, however, resources such as monitoring equipment, retrieval systems, attendants may be shared.

6. Emergency Response\ rescue - All emergencies are to be reported in order to 1) the UMass Police at 413-545-3111. UMass Police will then notify the Amherst Fire Department (who will deploy their Technical Rescue Team if needed), 2) Environmental Health & Safety and 3) the Facilities & Campus Services Solution Center, and 4) the University Department administering the contract (usually Design & Construction Management Project Manager).

R. Contractors intending to use a device labeled as a CLASS 3 or 4 laser, in the services required under the contract, shall notify the University Representative at least two (2) working days prior to the intended date of use. Utilization of such a device shall meet the Commonwealth of Massachusetts Regulations, under 105 CMR 121.000, entitled RULES AND REGULATIONS RELATIVE TO THE USE OF LASER SYSTEMS, DEVICES OR EQUIPMENT TO CONTROL THE HAZARD OF LASER RAYS OR BEAMS.

S. Prior to entry for review or work, in any areas storing or using radioactive material, the Contractor shall submit a written request for clearance, to the University of Massachusetts Division of Environmental Health and Safety (E.H.& S.) and the University Representative. No work shall be performed in such areas until a “Radiation Area Job Permit” has been approved, signed, and issued to the Contractor, by an official of E.H.& S. Such areas have the appropriate signs and labels posted at each entrance.

T. Prior to any entry in active laboratories, contractor employees that will be entering the space are required to receive laboratory safety training by UMA EH&S. When working in active laboratories, contractor employees must adhere to the posted PPE on the Laboratory Door Cards. Decontamination, chemical, biological and/or radiological may need to take place. To determine the extent of what needs to be done, contact EH&S Laboratory Safety. Work may not begin until EH&S has given clearance.

1.20 OSHA SAFETY AND HEALTH COURSE DOCUMENTATION

A. OSHA Safety and Health Course Documentation Records: Chapter 306 of the Massachusetts Acts of 2004 requires that everyone employed at the jobsite must complete a minimum 10-hour long course in construction safety and health approved by the U.S. Occupational Safety and Health Administration (OSHA) prior to working at the jobsite. Compliance is required of General Contractors’ and Subcontractors’ on-site employees at all levels whether stationed in the trailer or working in the field. Unless the Massachusetts Attorney General’s office indicates otherwise, this requirement does not apply to home-office employees visiting the site or to suppliers’ employees who are making deliveries.

B. Documentation records shall be initially compiled by the General Contractor and Subcontractors as part of their certified payrolls, and the General Contractor shall create and maintain a copy of the documentation on site at all times. On-site documentation shall be filed in alphabetical order and immediately available to UMA’s Project Manager and OSHA inspectors. Fines imposed for non-compliance shall be promptly paid by the General Contractor at no additional expense to UMA. Delays in the progress of the Work caused by such non-compliance will not be acceptable as the basis for an extension of contract time or change order request.
1.21 DAMAGE RESPONSIBILITY

A. The General Contractor shall repair, at no cost to UMA, any damage to building elements, site appurtenances, landscaping, utilities, etc. caused during demolition operation and work of this Contract.

1.22 OWNER FURNISHED PRODUCTS

A. Products indicated “N.I.C.” (Not in Contract), or “E. O.” (Equipment by Owner), or “O.F.O.I.” (Owner Furnished Owner Installed), or other similar acronyms as defined in the contract documents will be furnished and installed by the Owner. Coordination and provision of service lines for such products shall be included under these Construction Contract Documents, if indicated. Final connections from service lines to equipment will be by the Owner, unless otherwise indicated.

1.23 UMA OCCUPANCY

A. Beneficial Use and Occupancy: Refer to requirements in Section 017700 - CONTRACT CLOSEOUT, Par. 1.6.

B. Use and Occupancy: When the project is Substantially Complete (with all work affecting health, safety, and function totally completed, and with less than one percent (<1%) of the contract value remaining) and ready for Use and Occupancy as determined by the Designer, the UMA Project Manager and the Operating Agency, then the UMA will take control of their building area(s) and be responsible for operating costs and security.

1.24 ASBESTOS AND HAZARDOUS MATERIALS DISCOVERY

A. If unanticipated asbestos-containing materials or other Hazardous Materials not included in Contract are discovered at any time during the course of work, the General Contractor shall cease work in the affected areas only and continue work in other areas, at the same time notify UMA, UMA EH&S and the Designer of such discovery. Do not proceed with work in such affected areas until written instructions are received. If removal is required, payment will be made in accordance with the contract unit prices bid for each respective material. In the absence of unit prices, costs shall be negotiated or otherwise established prior to commencement of removal, in accordance with provisions of the Contract.

B. The UMA Project Manager and UMA EH&S will work with the Contractor to initiate removal or encapsulation of the asbestos. An extension of the completion date may be granted equal to the time lost. Proper notification must be made to the MADEP through the ANF-001 form, and the UMA EH&S.
1.25 SPECIAL REQUIREMENTS

A. The General Contractor shall prepare a Health and Safety Plan that addresses protection of employee and public health and safety. The minimum contents of the Plan are specified in Section 013300 – SUBMITTAL REQUIREMENTS.

B. The General Contractor shall be solely responsible for implementing the procedures specified in the Plan.

C. The General Contractor shall make available complete sets of personal protective equipment and clothing to UMA for use during site observations/inspections by UMA and the Designer. These shall be supplied and maintained at no cost to UMA and the Designer, and shall be returned to the General Contractor upon the completion of work, except for disposable protective clothing.

1. The General Contractor shall provide a repository for collection and disposal of health and safety materials. Collection and disposal of contaminated disposable supplies shall be at no additional cost.

1.26 LIST OF DRAWINGS

A. Refer to the Cover Sheet of the Drawings for the List of Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 011001

EVENTS SCHEDULE
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*Amherst, MA*

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Note: The calendar includes both basketball games and unspecified events. Basketball games that are confirmed are marked with a red box. Unspecified events are marked with an unspecified box.
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- **New Year's Day**
- **Martin Luther King Jr. Day**
- **Unspecified - Confirmed**
- **Unspecified - Granted Hold 1**

**January 2017**

*Note: The calendar includes key dates and holidays.*
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February 2017

- **St. Valentine's Day**: February 14
- **President's Day**: February 20
- **Mardi Gras**: March 5
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- Ash Wednesday
- Start of daylight saving time
- St. Patrick's Day
- Purim (begins at sundown)

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- April Fools Day
- Passover (begins at sundown)
- Good Friday
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**Status**

- Tentative
- Confirmed
- Blackout
- Pending
SECTION 012300

ALTERNATES

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 REQUIREMENTS INCLUDED

A. Definition: "Alternates" are alternate products, materials, equipment, systems, methods, units of work or major elements of the construction, which may, at the Awarding Authority’s option and under the terms established by the Contract or Agreement, be selected for the work in lieu of the corresponding requirements of the Contract Documents.

B. Alternate Requirements: A Schedule of Alternates is included at the end of this Section. Each alternate is defined using abbreviated language, recognizing that the Contract Documents define the requirements. Coordinate related work to ensure that work affected by each alternate is complete and properly interfaced with work of each selected alternate.

C. Provide written proposals for each alternate on the Form of Proposal for the Awarding Authority’s consideration. Each proposal amount shall include the entire cost of the alternate portion of the work including overhead, profit, taxes, insurance, and other costs including cost of interfacing and coordinating the alternate with related and adjacent work.

D. Selection of Alternates: Selection of alternates to be included in the work will be by the Awarding Authority. Alternates must be taken in order. The first alternate before the second alternate, etc.

E. Notification: Prepare and distribute to each entity a notification of status of each alternate. Indicate which alternates have been accepted or rejected, or when such decision is anticipated.

1.3 DESCRIPTION OF ALTERNATES

A. Add Alternate AA-01: Provide Mullins Center Center Hung Scoreboard Resolution Upgrade.

B. Add Alternate AA-02: Provide Mullins Center Endzone Scoreboard Resolution Upgrade.

C. Add Alternate AA-03: Provide Garber Field Scoreboard and Audio Project.

END OF SECTION
SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

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 SUMMARY

A. Without limitations, coordination will include Critical Path Method Scheduling (CPM), coordination of submittals, coordination of all elements of the Work, and coordination of contract closeout.

B. Description:

1. Coordinate scheduling, submittals, and work of the various Subcontractors and elements of the Work to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.
2. Coordinate sequence of the Work to accommodate UMA Partial (Beneficial) Occupancy.

C. Meetings:

1. In addition to progress meetings, hold coordination meetings and pre-installation conferences with personnel and Subcontractors to assure coordination of the Work

D. Coordination of Submittals:

1. Schedule and coordinate submittals.
2. Coordinate work of various Subcontractors having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
3. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other Subcontractors,

E. Mechanical and Electrical Coordination

1. Provide a part-time Mechanical/Electrical Coordinator (MEC) to the project to provide mechanical and electrical coordination. The name of the coordinator, together with his/her qualifications, shall be submitted to the UMA Project Manager and the Designer for approval.

F. The MEC shall be a highly design and construction coordination experienced individual, additional to the General Contractor’s Project Manager, Project Scheduler and Project Superintendent.
G. The MEC shall attend all construction meetings.

H. Coordinate all activities associated with commissioning activities and the work of the Test Technician.

I. Commissioning:

   1. A systematic process of ensuring that all building systems perform interactively according to the Designer’s design intent and the UMA’s operational needs.
   2. The commissioning process does not take away from, or reduce the responsibility of, the General Contractor and installing Subcontractors to provide a finished and fully functioning product.

1.3 MECHANICAL AND ELECTRICAL COORDINATOR (MEC)

A. The purpose of the General Contractor’s coordinator shall be to prevent conflicts in the installation of all materials and equipment for the entire project, but not specifically relating to the mechanical and electrical Subcontractors. Although the General Conditions and General Requirements of the construction contract apply to the General Contractor and all Subcontractors, respectively, with regards to the coordination of all Subcontractors, the General Contractor shall employ a Mechanical/Electrical Coordinator (MEC), in addition to the General Contractor’s coordinator, who shall specifically ensure and be responsible for the total and complete coordination of all work of the mechanical and electrical Subcontractors as such work relates to the General Contractor’s work and all other Subcontractors. The MEC shall be provided for the Project from initial project’s Notice to Proceed (D19) until all building systems have been accepted by both the Designer and the UMA Project Manager. The MEC shall be on-site part-time during the construction phases (a minimum of two days per week), but more frequently as needed for coordination of the work being performed.

   1. Have extensive experience in building construction, security and tele/data systems, food service equipment, medical and research equipment, elevators, HVAC, hot water heating, chilled water, plumbing, fire protection, electrical, emergency power, fire alarm, life safety systems or similar complexity to those contained in these documents or impacted by the work.
   2. Have excellent working knowledge of complex environmental, fire alarm, and electric power control and facility management systems; be capable of understanding control vendors’ operating system and control code, be capable of trouble-shooting control code and recommending necessary modifications.
   3. Be competent in systems design and intent.
   4. Have excellent communication and writing skills, be highly organized, and be able to work well with both management and Subcontractors.
   5. Minimum Bachelor’s degree in Mechanical Engineering with 10 years (minimum) experience in the design and field administration of building mechanical and electrical systems, and working knowledge of project scheduling.
   6. The General Contractor shall submit the MEC’s resume and sample documents to the UMA Project Manager and Designer for approval; which shall include the following:
      a. Education and technical training.
      b. Relevant work experience:
         1) Job name
         2) Position held
3) Work history (include dates and positions held)
   c. Examples of prior building commissioning projects performed by the proposed MEC:
      1) List of projects similar in commissioning scope and complexity, including dates of project completions.

B. The MEC cannot be financially associated with any of the Division 01 through 31 Subcontractors or vendors prior to engaging in this contract, to avoid potential conflicts of interest.

C. The UMA Project Manager and Designer reserve the right to personally interview MEC candidate prior to accepting placement in the position. Final approval of the MEC will be by the UMA Project Manager. Additionally, any change in the approved MEC shall require the prior consent of the UMA Project Manager.

1.4 MECHANICAL AND ELECTRICAL COORDINATOR’S DUTIES

A. Coordinate the work of the Mechanical and Electrical Subcontractors:
   1. For temporary utilities.
   2. Among the work of the mechanical and electrical Subcontractors.
   3. Among the work of all other Subcontractors, including the mechanical and electrical Subcontractors.

B. Coordinate the schedule of Mechanical and Electrical Subcontractors:
   1. Verify timely deliveries of products for installation by other Subcontractors.
   2. Verify that labor and materials are adequate to maintain schedules.

C. Conduct conferences among Mechanical and Electrical Subcontractors and other concerned parties, as necessary to:
   1. Maintain coordination and schedules.
   2. Resolve matters in dispute.

D. Participate in all project meetings:
   1. Report progress of all mechanical and electrical work.
   2. Recommend needed changes in schedules.
   3. Transmit minutes of meetings to mechanical and electrical Subcontractors, as appropriate.
   4. Commissioning meetings.

E. Temporary Utilities:
   1. Coordinate installation, operation, and maintenance, to verify compliance with project requirements and with Contract Documents.

F. Shop Drawings, Product Data and Samples:
1. Prior to submittal, review for compliance with Contract Documents.
   a. Check field dimensions and clearance dimensions.
   b. Check relation to available space.
   c. Review the effect of any changes on the work of other contracts or other Subcontractors.
   d. Check anchor bolt settings.
   e. Check compatibility with equipment and work of other Subcontractors.
   f. Check motor voltages and control characteristics.
   g. Coordinate controls and interlocks:
      1) Voltages.
      2) Wiring of pneumatic and control diagrams.
   h. Coordinate wiring and control diagrams.

G. Coordination Drawings:

1. In addition to the coordination drawings submitted by the Mechanical and Electrical Contractors, prepare additional drawings as required to assure coordination of the work, or affected by, mechanical and electrical work, or to resolve conflicts.
2. Reproduce and distribute approved copies to all concerned parties.

H. Verify that Subcontractors maintain accurate Record Documents.

I. Substitutions and Changes:

1. Review proposals and requests.
   a. Check for compliance with Contract Documents.
   b. Verify compatibility with work and equipment of other Subcontractors.
2. Recommend action to General Contractor.
3. Test materials, assemblies and/or fabrications that are submitted as substitutions, when necessary to assure that they meet contractual design standards.

J. Observe mechanical and electrical work for compliance with requirements of the Contract Documents:

1. Maintain list of observed deficiencies and discrepancies.
2. Promptly report deficiencies and discrepancies to General Contractor.

K. Assemble documentation for handling of claims or disputes involving mechanical and electrical Subcontractors.

L. Equipment Commissioning:

1. The MEC shall coordinate all commissioning activities with the Owner’s commissioning agent.

M. Inspection and acceptance of equipment:

1. Prior to inspection, check that equipment is clean, repainted as required, tested and operational.
2. Assist inspector; prepare list of items to be completed or corrected.
3. Should acceptance and operation of equipment constitute the beginning of the guarantee period, prepare, and transmit written notice to the General Contractor, for his/her transmittal to the Designer and the UMA Project Manager for concurrence.

N. Assemble As-built documents from Subcontractors, transfer Subcontractors’ As-built documentation to electronic format, and transmit to Designer. All information shall be submitted on electronic media (CD). Drawings should be on AutoDesk AutoCAD ver. 2000 or later, word documents in .pdf format, baseline and subsequently approved schedules in Primavera format, schedule of values in Excel format, and approved shop drawing submittals scanned in showing model numbers, capacities, and all relevant information that can be automatically propagated to the UMA CAMIS system. (Refer to Section 017700 – CONTRACT CLOSEOUT for additional formatting requirements).

1. As-built documents will be compiled on compact disks and will include, without limitation, the following:
   a. All Drawings, including title sheet, code analysis, geotechnical, civil, structural, architectural, fire protection, plumbing, mechanical, electrical, security, data/telecommunications.
   b. All Specifications in .pdf format with addenda.
   c. Shop drawings and product cuts, scanned in; approved sheets only.
   d. Project schedules, baseline and all updates.

O. Oversee and provide training for the systems to be commissioned

1. Verify that the UMA’s operating personnel are trained in each particular commissioned equipment’s operation and maintenance.
2. Obtain a written sign-off, from the responsible UMA’s personnel, that certify they are capable to operate and maintain the particular commissioned equipment such that their health and safety are not compromised.
3. Verify that all training requirements meet the specified training within the particular specification divisions and the requirements of this specification section.
4. Verify that training is provided only from certified instructors. The instructors shall be certified and approved by the particular equipment manufacturer. In the absence of manufacturer’s certification, the trainer shall have a minimum of ten years experience in the installation, operation, and repair of the particular equipment.
5. Verify that all training is videotaped by a professional who is regularly employed in video photography.

P. Verify that O & M documentation is complete and approved by the Designer and the UMA Project Manager prior to transmittal to the UMA.

1.5 MECHANICAL AND ELECTRICAL COORDINATOR’S COORDINATION DRAWINGS

A. Cause to be prepared and submit to the General Contractor, coordination drawings for site utilities and building(s), for Designer and the UMA Project Manager’s review.

B. Sequence of Coordination Drawings preparation shall be as follows:

1. Coordination Drawings: The General Contractor shall be fully responsible for coordinating all Subcontractors, coordinating construction sequences and schedules, and
coordinating the actual installed location and interface of all work. Before materials are fabricated or the Work begun, the General Contractor shall supervise and direct the creation of one (1) complete set of Coordination Drawings showing the complete coordination and integration of all Work of this Project including, but not limited to, structural, architectural, mechanical, plumbing, fire protection, and electrical disciplines. Coordination Drawings are intended to assist the General Contractor during construction and shall not be used for “shop drawings”, “record drawings”, or any other required submittal.

a. Base Sheets: The General Contractor shall prepare and provide one accurately scaled set of building coordination drawing “base sheets” on reproducible transparencies or electronic format showing all architectural and structural work. Base sheets shall be at 1/4-inch scale, except congested areas and sections through vertical shafts shall be at 3/8-inch scale.

b. HVAC: The General Contractor shall circulate the coordination drawing base sheets to the HVAC Subcontractor and require the HVAC Subcontractor to accurately and neatly show the actual size and location of all HVAC equipment and work. Ductwork shall be drawn to scale with full dimensions indicated graphically. Single line diagrams are not acceptable. The HVAC Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor.

c. Plumbing: The General Contractor shall circulate the coordination drawings to the Plumbing Subcontractor and require the Plumbing Subcontractor to accurately and neatly show the actual size and location of all plumbing equipment and work. The Plumbing Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor. Sloped plumbing lines have right of way.

d. Electrical: The General Contractor shall circulate the coordination drawings to the Electrical Subcontractor and require the Electrical Subcontractor to accurately and neatly show the actual size and location of all electrical equipment and work. The Electrical Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor.

e. Fire Protection: The General Contractor shall circulate the coordination drawings to the Fire Protection Subcontractor and require the Fire Protection Subcontractor to accurately and neatly show the actual size and location of all electrical equipment and work. The Fire Protection Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor.

f. Other Subcontractors: The General Contractor shall circulate the coordination drawings to other Subcontractors whose work might conflict with other work and require these Subcontractors to accurately and neatly show the actual size and location of all their equipment and work. These Subcontractors shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor.

g. After each Subcontractor completes its drawings, a meeting will be held to resolve conflicts between the Subcontractors.

1) Coordination drawings shall be prepared at not less than 1/4-inch scale, and electronic AutoCAD files of same.

2) Submit drawings to the General Contractor for Designer’s review prior to starting any installations.

3) Items of impossibility or request for variance shall be called to the General Contractor’s attention for the Designer’s resolution.
h. General Contractor Review and Submission: The General Contractor shall carefully review, modify and approve coordination drawings in cooperation with the Subcontractors to assure that conflicts, if any, are resolved before work in the field is begun and to ensure that the location of work exposed to view is as indicated or as approved by the Designer and the UMA Project Manager.

1) Prior to submittal of the coordination drawings, the Subcontractors shall affix their signatures to the drawings.

2) Clearly indicate conflicts requiring modification to the general appearance or the function of the project for Designer and UMA Project Manager's reviews, and approvals.

3) The General Contractor shall stamp, sign and submit the coordination drawing originals to the Designer for review and approval, with one (1) paper copy and one (1) additional electronic copy on compact disk to the UMA Project Manager, following the specified procedures and policies outlined in Section 013300 – SUBMITTAL REQUIREMENTS. In no case shall acceptance of coordination drawings be interpreted as a release of General Contractor of responsibility to fulfill all of the requirements of the Contract Documents.
SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

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 REQUIREMENTS INCLUDED

A. Procedures and requirements for submission and review of progress schedules and reports.

1.3 RELATED SECTIONS

A. CONTRACT AND GENERAL CONDITIONS

1. Failure to complete the Work on time - liquidated damages.

B. Section 011000 – SUMMARY

1. Project meetings.

C. Section 013100 - PROJECT MANAGEMENT AND COORDINATION

1. Progress and coordination meetings.

D. Section 013300 - SUBMITTAL REQUIREMENTS

1. Project reports.
2. Schedule of values.
3. Shop drawings, product data, and samples.

E. Section 015000 - TEMPORARY FACILITIES AND CONTROLS

1. Computer equipment hardware, software, and ancillary supplies.

1.4 CONSTRUCTION SCHEDULE

A. General Contractor shall prepare and submit for Designer and UMA’s information, a Critical Path Method (CPM) Progress Schedule for the work of the project. Said schedule will be coordinated with the Designer’s Work Plan to include sequencing of the project work (both design and construction). In addition, a Project Scheduler will be required for this project.
1. General Schedule Requirements
2. Critical Path Method (CPM) Schedule Requirements
3. Critical Path Submission Requirements
4. Critical Path Progress Reporting and Changes
5. Progress Payments to General Contractor
6. Adjustment of Critical Path Contract Completion Time

B. Critical Path Method Scheduler.

C. Design of Project.

1.5 CRITICAL PATH METHOD SCHEDULING

A. General Contractor’s Schedule Requirements are contained herein, and are to be provided to UMA by the General Contractor.

1. General Schedule Requirements
   a. Upon the finalization of the agreement, signified by issuance of the UMA Notice to Proceed with Construction, the General Contractor shall develop a network plan to demonstrate complete fulfillment of all Working Documents and Construction contract requirements. The General Contractor shall keep the network plan up to date in accordance with the progress and logic update requirements stated herein, and shall utilize the network plan in planning, coordinating and performing the work of this project (including all activities of Designer, Subcontractors, equipment vendors and suppliers). General Contractor’s monthly payments will be made in direct relation to the activity items scheduled and by the progress completion of those activities. Upon authorized commencement of the construction phase of the contract, as signified by the UMA Notice to Proceed with Construction, the General Contractor shall provide the microcomputer, associated hardware and software required for the project site as defined under Section 015000 – TEMPORARY FACILITIES AND CONTROLS, Par. Computers. Substitute software, approved in writing by UMA, will be considered provided that the promised substitution is totally compatible with PRIMAVERA and all UMA software.
   b. Within 20 calendar days of receipt of the UMA Notice to Proceed with Construction, the General Contractor shall submit to UMA and the Designer, an expanded Time Scaled Critical Path Method (CPM) Network Diagram for the first 90 calendar days of the Construction phase of the project. This preliminary 90-day schedule need not be resource loaded.
   c. Within 60 calendar days after receipt of the UMA Notice to Proceed with Construction, the General Contractor shall submit for review by UMA and the Designer, a complete Time Scaled Critical Path Method (CPM) Network Diagram for the complete project, including all construction phases. All completion dates shall be within the period required by the contract for completion of the project. This complete duration project schedule must be fully resource loaded. The General Contractor shall provide a presentation where the schedule’s activities and logic are fully explained.
   d. Within 15 calendar days after receipt of the complete Critical Path Method Network Diagram, UMA and the General Contractor shall meet with the Designer and their consultant engineers and Subcontractors, and the Project Scheduler, for
Within 10 calendar days after the joint review(s), the General Contractor shall revise the proposed Critical Path Method (CPM) Network Diagram in accordance with agreements reached during the joint review(s) and shall furnish two copies of the Diagram as defined hereinafter (in Para. 1.5.3), to the UMA and one copy to the Designer. This CPM Network Diagram, as revised at the joint review, is the Project Schedule (and shall be the Target Schedule to which all future changes are compared) until subsequently revised in accordance with the logic update requirements stated hereinafter (in Para. 1.5.4). All appropriate Subcontractors shall also be furnished copies of the Time Scaled Network Diagram.

e. Until the joint review(s) and subsequent issuance of the complete Project Schedule, as defined hereinbefore, the establishment of the PRIMAVERA database, all Payment Requisition Schedule of Values and General Contractor Payment Forms may be produced manually.

2. Critical Path Method (CPM) Scheduling Requirements

a. The Critical Path Method (CPM) schedule shall show the sequence and interdependence of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown on the Critical Path schedule must be at least equal and related to the number of items listed in the Schedule of Values, however the General Contractor must submit a detailed explanation that identifies what each activity includes. In preparing the Critical Path schedule, the General Contractor shall break up the work into activities not exceeding two calendar months each, except as to non-construction activities (i.e., design, procurement of materials and delivery of equipment) and any other activities for which UMA may approve the showing of longer duration. The schedule shall show not only the activities for actual design and construction work for each Subcontractor category of the project but also activities on which the work is dependent (i.e., such as the submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication, material delivery times, Designer/UMA review and approval of design documents and shop drawings, equipment schedules, samples and templates, and the delivery of Owner furnished equipment). In addition, the complete duration project schedule submission that is to be made 60 calendar days after receipt of the UMA Notice to Proceed with Construction shall be resource loaded with costs, manpower (labor by craft or Subcontractor), and equipment for all on-site construction activities shown on the schedule. All activities shall be logically tied to one common end date. The number of construction activities shown on the Critical Path schedule shall be capable of being summarized to a level equivalent to the individual specification sections, for which any item of work is being performed (defined hereinafter in Para. 1.5.2.b). To the extent that the Critical Path schedule shows anything not jointly agreed upon, or fails to show anything jointly agreed upon, it shall not be deemed to have been accepted by UMA. Failure to include any element of work required for the performance of the contract shall not excuse the General Contractor from completing all work required within any applicable completion date, notwithstanding UMA acceptance of the Critical Path schedule.

b. The baseline data to be entered for each individual activity shall include the duration, activity type, activity codes, work breakdown structure, date constraints, cost, resources, custom data items, predecessor activity, and successor activity.

1) Critical Path Method (CPM) Scheduling shall be carried as a specific pay item on the Schedule of Values.
2) Each activity shall be assigned a Work Breakdown Structure (WBS) Code. The WBS is to be structured in levels of deliverable work elements beginning with the end result (Level 1), and then divided into identifiable deliverable work elements (Level 2, 3, 4, etc.). The UMA Project Manager, Designer and General Contractor will meet to establish a WBS specific to the project.

3) Each activity shall be assigned Activity Codes. The Activity Codes shall identify specific groups such as responsibility, phase, system, location, CSI Division, specification section, and corresponding Schedule of Values ID. This is not a complete list. The UMA Project Manager, Designer and General Contractor will meet to establish Activity Codes specific to the project.

3. Critical Path Submission Requirements (CPM Network Diagram elements)
   a. As a minimum, the General Contractor shall furnish, monthly with each Critical Path Submission, and each revision thereof required in the logic update, three (3) copies of the following PRIMAVERA output reports (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Current Schedule Comparison to Target Schedule
      2) Network Logic: Detailed Precedence Analysis
      3) Activity Input Listing sorted by WBS or Activity Codes, per UMA Project Manager
      4) Schedule sort by Early Start and Total Float
      5) Actual Cash, Manpower and Equipment Flows (on schedule - Monthly; late schedule - Weekly)

   b. As a minimum, the following computer-produced PRIMAVERA graphic reports shall be supplied with each Critical Path Submission and revision thereto (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Gantt Chart sorted by Early Start date and WBS or Activity Codes, per UMA Project Manager
      2) Bar Chart - Two Week Look Ahead sorted by WBS or Activity Codes, per UMA Project Manager (and narrative format if requested by the UMA Project Manager, at no additional cost). A two-week look ahead schedule, generated from the Project Schedule, shall be submitted for review and discussion at the weekly project meeting.
      3) Time Scaled Network Diagram (PERTVIEW) sorted by WBS or Activity Codes, per UMA Project Manager
      4) Cash, Manpower and Equipment Flows (monthly and cumulative)

   c. Payment requisition Schedule of Values (CSI formatted) and General Contractor Payment form, to be produced monthly through custom software which uses the PRIMAVERA database percentage complete to calculate payment owed to General Contractor.

   d. PRIMAVERA Database: The complete PRIMAVERA database for the project shall be submitted monthly with each Critical Path Submission on a floppy disk or as otherwise requested by UMA.

   e. Material/Supplies Schedule: As a minimum, a full list of all materials required for the project shall be listed. This list shall include coded sub-lists (per Para. 1.5.7) relating to the activity codes of the Critical Path Method schedule. The Material/Supplies Schedule sub-lists shall be required which list all materials required for critical activities, all items of long lead time nature (i.e., transformers, plantings, windows, doors and frames, electrical and mechanical equipment, etc.), all pre-purchase items and all Owner-furnished items. The schedule shall provide
names, addresses, telephone numbers of suppliers, key suppliers’ contact person, order placement data, order confirmation data, proposed arrival date, actual arrival date and all other pertinent information. This Critical Materials/Supplies Schedule and its associated sub-lists shall be updated as directed by the UMA and as a minimum at each Logic Update period.

f. Utilities Schedule: As a minimum, a full list of all utilities required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of utility, usage levels required, and timing of requirements.

g. Equipment Schedule: As a minimum, a full list of all equipment required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of equipment, usage levels required, and timing of requirements.

4. Critical Path Progress Reporting and Changes (Progress and Logic Update)

a. The General Contractor shall provide a complete progress and logic update monthly. The progress and logic update shall include complete updating of the schedule progress per activity --- both amount paid and amount remaining. Actual cost amount paid and amount remaining shall agree with the payment requisition forms required hereinafter (in sub-paragraph 1.5.3.c.). The requirements for schedule progress reporting are further specified hereinafter. A full Critical Path Submission will be required at each progress and logic update.

b. In addition to the progress and logic update requirements, the General Contractor shall prepare and submit to UMA a revised Critical Path Submission showing all changes in network logic, including but not limited to changes in activity duration, and revised activity costs as a result of contract changes in activity sequence and any changes in contract completion dates which have been made pursuant to the provisions of the contract for adjustment of contract completion time, since the last revision of the critical path schedule. The contract completion date or dates shall be adjusted to reflect time extensions granted on the activities in accordance with the contract. The contract completion date or dates shall remain constant when data in regards to actual progress (activity start, activity completion, percent completed, etc.) are entered and delay shows a negative float/slack. Where UMA has not yet made a final determination, as to the amount of time extension to be granted and the parties are unable to agree as to the amount of the extension to be reflected in the critical path schedule, the General Contractor shall reflect that amount of time extension in the critical path schedule as UMA may determine in their best judgment, to be appropriate for such interim purpose. It is understood and agreed that any such interim determination by UMA for the purposes of this paragraph shall not be binding upon either party for any other purpose and that, after UMA has made final determination as to any time extension, the General Contractor will revise the critical path schedule prepared thereafter in accordance with the final decision, in accordance with the contract.

c. Prior to the date specified by UMA for submission of the logic update (i.e., at each General Contractor pencil monthly payment requisition, one week prior to the approval of the General Contractor monthly payment requisition), the Project Scheduler, including input from General Contractor, Subcontractors, and the Designer, shall update the computer-produced schedule and diagrams. The update shall show actual progress and percent completed of activities in progress, identify those activities started and those completed during the previous logic update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the critical path schedule approved in

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accordance with the Critical Path Scheduling Requirements and Progress and Logic Update paragraphs of this Section (Para. 1.5.2 and 1.5.4). Actual progress to-date shall be entered by inputting actual start date and remaining duration (or early finish) for each activity which has either started during the monthly update period or is ongoing. In addition to entering remaining duration, the percent complete shall be entered for that activity. However, percent complete calculation shall be set to manual using the project default screen. After completion of the review and UMA approval of all entries, the General Contractor shall submit an updated Critical Path Submission, in the detail specified in the Critical Path Submission Requirements of this Section (Para. 1.5.3), to UMA, no later than the close of business on the date specified by UMA for submission of edited General Contractor monthly payment requisition (normally one week after pencil monthly payment requisition review).

d. The General Contractor shall assume that the full duration of the contract will be required to complete the work of the contract. Positive float/slack belongs to the project and must be used in the best interest of completing the project on time in the event departure from the network occurs. If negative float/slack is indicated on the schedule, recovery schedules shall be prepared by the General Contractor at no additional cost to the Commonwealth, indicating how the work will be expedited to meet current contract completion dates. The General Contractor’s construction schedule shall begin with the date of issuance of the UMA Notice to Proceed and conclude with the contract date of Final Completion of the Project. Float or slack time within the construction schedule is not for the exclusive use or benefit of either the Commonwealth or the General Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the contract completion date. Therefore, any existing float shall be used to the maximum extent possible to offset:

1) Unexpected delays which occur in connection with the General Contractor’s work; and

2) Contract change actions initiated by the parties specified in the contract (i.e., Changes in the Work).

e. Where delays are incurred, the General Contractor shall provide through weekly and/or full logic CPM update how the work delay can be returned to the approved schedule. The General Contractor agrees that whenever it becomes apparent from the current weekly computer produced calendar-dated schedule that the contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the Commonwealth:

1) Increase design review and/or construction manpower and/or equipment in such quantities and crafts as will substantially eliminate, in the judgment of the UMA, the backlog of work and any impact on the construction activities.

2) Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of the UMA, the backlog of work.

3) Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

f. Float shall be used as it occurs (time extension granted or job delay). If a time extension and job delay occurs in the same logic update period (normally weekly), the delay will be entered in the network first.

g. In addition to the foregoing, the General Contractor shall submit a narrative report every other week (bi-weekly) and at the same time as the updated schedule
required by the preceding paragraphs in a form agreed upon by the UMA. The narrative report shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.

h. The UMA shall have the right to require the General Contractor to furnish additional printouts of logic updated schedules and time scaled network diagrams, reflecting actual or estimated time changes resulting from unexpected delays, change orders, strikes, etc., at no additional cost to the Commonwealth.

5. Progress Payments to General Contractor
   a. The monthly Critical Path Submission shall be an integral part and basic element of the estimate upon which progress payments shall be made. The General Contractor shall be entitled to progress payment only upon approval of estimates as determined from the currently approved updated computer-produced Critical Path schedule. Payments will be made against activity items shown on the computer-produced schedule and as reflected on UMA approved format payment forms which shall be used in conjunction with PRIMAVERA. The General Contractor shall produce the Schedule of Values and the Standard Payment forms by following the guidelines of UMA staff. This shall include entering the Net Amount Paid to Subcontractors against the appropriate activities.

   b. Whereas every schedule activity is cost loaded, as well as manpower and equipment loaded (i.e., the schedule of payment values lists all schedule activities, at the end of every month the General Contractor’s payment application is a listing of all schedule activities started and completed, the percentage of work accomplished, and a calculation of the value of the work performed), but the Commonwealth is required to pay for work performed within a mandated time frame, the submittal of the schedule update is not a “condition precedent” to monthly progress payments; however, in the event the General Contractor fails to submit a computer-produced calendar-dated schedule or the initial or revised time scaled network diagram on the date designated by UMA, UMA shall have the right, after giving written notice to the General Contractor, to have the computer-produced calendar-dated schedule or time scaled network diagram prepared or revised (as applicable) by separate computer contract award or otherwise and to deduct the cost thereof from the contract amount through the progress payment which becomes due upon completion thereof and upon approval of UMA of the payment request. If, however, the General Contractor fails or refuses to furnish the information and data which, in the judgment of the UMA Project Manager, are necessary for preparation or revision of the computer-produced calendar-dated schedule or time scaled network diagram by separate contract or otherwise, after seven [7] calendar days written notice, the schedule requirement terms of the contract may be considered to have been breached by the General Contractor, and UMA may take any or all of the following additional actions:

   1) Impose lack-of-schedule damages (separate and distinct from liquidated damages), at a cost of $300 per day for every day the schedule submittal is late.

   2) Terminate the contract with prejudice (per Article XVII of the Contract).

6. Adjustment of Critical Path Contract Completion Time
   a. The contract completion time or contract cost will and in general be adjusted only for change orders approved by UMA as outlined in the contract. In the event the General Contractor requests an extension of any contract completion date or cost increase he/she shall furnish such justification and supporting evidence as UMA
may deem necessary for the determinations to whether the General Contractor is entitled to an extension of time or contract cost adjustment under the provisions of this contract. UMA approval as to the total number of days extension and/or increase in contract value shall be based upon the currently accepted computer-produced Critical Path schedule and on all data relevant to the extension. A request for an extension of time, associated with the change orders will not be considered unless it is clearly proven that the critical path has been negatively affected (such as, but not limited to, time impact analysis using resource loaded fragmentary networks to demonstrate the effect of delays on the overall project schedule). Such data shall be included as an activity linked to the activity which is being impacted and will appear in the next monthly schedule and logic update. All extensions for related manpower/equipment increases shall be applied to the appropriate existing activity items.

1) **Contract time can only be extended by authorized approved change order.**

b. Whereas time is of the essence in the performance of work under the contract, each request for change in any contract completion date shall be submitted by the General Contractor to UMA at the time an alleged delay occurs. Failure to notify UMA of any delay as provided in the contract shall preclude the General Contractor from subsequently claiming any damages due to said delay.

c. For purposes of scheduling, the project will be considered to be Substantially Complete when all work affecting health, safety and function is totally completed, and with less than one [1] percent of the base contract value remaining, and ready for complete Use and Occupancy as determined by the UMA Project Manager, the Operating Agencies (individually or collectively), and the Designer. Then the User Agencies (individually or collectively) will take control of their building area(s) and be responsible for operating costs and security. Final punch lists will be established and monetized at this time.

1) UMA Certificate of Use and Occupancy must be issued for partial Use and Occupancy, contingent upon conditions set forth by the Building Official having jurisdiction. The Massachusetts Department of Public Safety Occupancy Certificate must be issued by the effective Substantial Completion date.

2) The General Contractor shall have the number of calendar days stated in the contract, from the date of the UMA Notice to Proceed, to complete all the work before Substantial Completion is achieved. If the General Contractor fails to complete the work within the contract completion time frame so stated, the General Contractor shall be subject to the assessment of liquidated damages.

7. **Additional Requirements:**

a. A list in EXCEL format and the associated database file, as prescribed by UMA, of every submittal of shop drawings, product data, samples and other submittals required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
b. A list in EXCEL format and the associated database file, as prescribed by UMA, of every long lead item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor’s Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

c. A list in EXCEL format and the associated database file, as prescribed by UMA, of every pre-purchase item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor’s Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

d. A list in EXCEL format and the associated database file, as prescribed by UMA, of every Owner-furnished item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor’s Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date. The list of Owner-furnished items shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will actually be required on the site.

1) Deliveries of Owner-furnished equipment or materials shall be shown on the schedule with time windows to be provided by the Commonwealth.

2) Neither the Designer nor the Commonwealth will be responsible for acceptance of a list that calls for out-of-sequence delivery of Owner-furnished items.

1.6 CRITICAL PATH METHOD SCHEDULER

A. The General Contractor shall provide a full-time, independent, project-dedicated scheduler who shall attend all progress and logic update meetings to address project progress, alleged delays and cost or time impacts. The name of the Project Scheduler, together with his qualifications, shall be submitted to the Designer and UMA Project Manager for mutual approval. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be on projects of similar scope and value to this project. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler. A Project Scheduler who the UMA Project Manager deems unqualified, or who engages in “schedule gamesmanship” rather than consciously and accurately portraying progress of the work, will be replaced at no additional cost to the Commonwealth.

B. The General Conditions and General Requirements of the construction contract apply to the General Contractor with regards to responsibility for the scheduling of all Subcontractors. The
Project Scheduler shall ensure the total and complete scheduling of all work of the project as such work relates to the General Contractor’s work and all Subcontractors.

C. The purpose of the Project Scheduler shall be to accurately portray all relevant activities required to complete the work according to the contract documents, organized in a logical sequence and, generally, time scaled.

D. Preferential sequencing (i.e., whereby activities that could be performed concurrently and are established in the project schedule as sequential simply to consume float), and/or indicating artificial activity durations (i.e., inflating activities in the schedule to consume float and influence the critical path) are unacceptable. The Project Scheduler will provide monthly comparisons of the start and finish dates with field records of UMA inspection staff, job photos, weekly meeting minutes, monthly progress reports, General Contractor weekly bar charts or two-week look ahead schedules, and accurately update the schedule to reflect actual job progress.

1. Pursuant to the float-sharing requirements of the contract documents, the use of float suppression techniques (a.k.a., sequestering float) such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and the use of float time disclosed or implied by the use of alternate float suppression techniques shall be shared to the proportionate benefit of the UMA and the General Contractor.

2. Sequestering of float shall be cause for rejection of the General Contractor’s schedule submittal. In the event that float sequestering is identified the General Contractor, through the Project Scheduler, shall have the computer-produced calendar-dated schedule or time scaled network diagram revised appropriately, at no additional cost to the Commonwealth.

E. The General Contractor, through the Project Scheduler, shall require the Designer, all major Subcontractors (including, but not limited to, Site Work, Masonry, Structural Steel, Fireproofing, Roofing, Elevators, Mechanical, Plumbing, Electrical, and all other Subcontractors with a subcontract equal to or in excess of five [5] percent of the contract value) to participate in and sign off on the baseline schedule and all schedule updates. The General Contractor must submit an as-built construction schedule (certified by the General Contractor’s Project Manager and the Project Scheduler as representing the way the project was actually constructed) as a condition precedent to Final Acceptance.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 013300

SUBMITTAL REQUIREMENTS

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 REQUIREMENTS INCLUDED

A. Shop drawings, products data, samples, submittal logs (shop drawings and samples, RFI, NOI, PCO, CO and SK drawings), weather protection (if applicable) and schedule of values.

1.3 SHOP DRAWINGS, PRODUCTS DATA, AND SAMPLES

A. General:

1. Review and submit to the Designer and where outlined below to the UMA Project Manager, shop drawings, project data and samples required by Specifications Sections in hard and electronic copies.
2. No submissions made by FAX will be accepted.
3. The General Contractor, within the time frame stated in Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION after the Pre-Construction Meeting, shall prepare and submit for the Designer and the UMA Project Manager’s approval, a Schedule of Shop Drawings, Product Data and Samples required to be submitted for the Work. The schedule shall indicate, by Subcontractor, the date by which final approval of each item must be obtained, and shall be revised as required by conditions of the Work, subject to the UMA Project Manager’s approval. The Schedule of Shop Drawings, Product Data and Samples shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will be required on the site. Neither the Designer nor the UMA Project Manager will approve a schedule that calls for out-of-sequence submittals.

B. Shop Drawings:

1. Original drawings shall be prepared by General Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the Work, showing fabrication, layout, setting, or erection of details.
   a. Shop drawings shall be prepared by a qualified detailer.
   b. Details shall be identified by reference to sheet and detail numbers indicated on Contract Drawings.
   c. Maximum sheet size shall be 30-inch by 42-inch.
d. Submit with the required number of opaque prints specified and electronic media herein.

C. Product Data:

1. Manufacturers' catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data. Provide manufacturer's catalogue sheet, specification for each product and other pertinent data as required under the individual specification.
   a. Modify product data submittals to delete information which is not applicable to the project.
   b. Supplement standard information to provide additional information applicable to the project.
   c. Clearly mark each copy to identify pertinent materials, products, or models.
   d. Show dimensions and clearances required.
   e. Show performance characteristics and capacities.
   f. Show wiring diagrams and controls.
2. All such data shall be specific and identification of material or equipment submitted shall be clearly made in ink. Data of general nature will not be accepted.
3. Product Data shall be accompanied by transmittal notice. The General Contractor's stamp of approval shall appear on the printed information itself.
4. Submit the information listed above in both hard and electronic format.

D. Samples:

1. Physical samples shall illustrate materials, equipment, or workmanship, and shall establish standards by which work is judged. After review and approval, samples may be used in construction of project if not retained for comparison
   a. Office samples of sufficient size and quantity shall clearly illustrate:
      1) Functional characteristics of product or material, with integrally related parts and attachment devices.
      2) Full range of color samples (including standard and premium ranges).
      3) After review and approval by Designer and the UMA Project Manager, samples may be used in construction of project if not retained for comparison.
   b. Field Samples and Mock-ups
      1) Erect at project site at locations acceptable to the Designer and the UMA Project Manager.
      2) Construct each sample of mock-up complete, including work of all Subcontractors required in finished work. Samples shall be incorporated into a larger mock-up with varied products and Subcontractors if required.
2. Unless otherwise specified in the individual Section, the General Contractor shall submit two labeled specimens of each Sample.
3. Samples shall be of adequate size to permit proper evaluation of material. Where variations in color or in other characteristics are to be expected, samples shall show the maximum range of variation. Materials exceeding the variation of the approved samples will not be approved on the Work.
4. Samples which can be conveniently mailed shall be sent directly to the Designer, accompanied by transmittal notice. On the transmittal notice the General Contractor shall stamp his approval of Samples submitted.
5. All other Samples shall be delivered at the field office of the UMA Resident Engineer with Sample identification tag attached and properly filled in. Transmittal notice of Samples so delivered with the General Contractor's stamp of approval, shall be mailed concurrently to the Designer and the UMA Project Manager to confirm their receipt thereof.

6. If Sample is rejected by the Designer, a new Sample shall be resubmitted in the manner specified herein above. This procedure shall be repeated until the Sample is approved in writing by the Designer.

7. Samples will not be returned unless return is requested at the time of submission. The right is reserved to require submission of Samples whether or not specified in the Specifications, at no additional cost to the Commonwealth.

E. Mock-ups: Erect at project site at location acceptable to Designer and the UMA Project Manager, a mock-up complete, including work of all Subcontractors required in finished work.

1.4 GENERAL CONTRACTOR'S RESPONSIBILITIES:

A. Review shop drawings, Product Data and Samples prior to submission. Verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with Specifications.
5. Integration with adjoining work.
6. Delivery schedule.
7. Is the product an equal to the product specified or a substitution? If either of these occur a comparison sheet must be submitted comparing the proposed product to the product specified.

B. All shop drawings prepared by Subcontractors shall be processed through the General Contractor. The General Contractor shall check all the shop drawings for conformity with the Contract Documents and particularly for field measurements and proper fit with adjoining work prior to submitting same to the Designer for approval. Certification shall appear on each shop drawing stating that the General Contractor has made his/her check. Format and content of the General Contractor’s certification stamp shall be subject to approval by the UMA Project Manager and the Designer and shall include, but not be limited to:

1. The Term "By Others" shall not be used on shop drawings, the General Contractor shall state by whom related items are to be furnished and/or installed.
2. The Designer reserves the right to reject and return to the General Contractor, without examination, any shop drawings which have not been previously checked and certified as outlined above, which carry the term "by other" or such vague reference, which are difficult to read, which have arrived by FAX or which in any way are obviously not in conformity with Contract Requirements.
3. Shop drawings shall show materials, design, dimensions, connections and other details necessary to ensure that they accurately interpret the Contract Documents and shall also show adjoining work in such detail as required to provide proper connection with same.
4. The Designer will check and approve shop drawings only for conformance with the design concept and for compliance with information given in the Contract Documents. Approval of shop drawings by the Designer will not release the General Contractor from
his responsibility for furnishing same of proper dimensions, size quantity and quality to effectively perform the work and carry out the requirements and intent of Contract Documents.

5. Such approval will not relieve the General Contractor from responsibility for errors of any sort in the shop drawings, nor for the proper coordination of any submittal with all other work. If the shop drawings deviate, or are intended to deviate, from the Contract Documents, the General Contractor shall so advise the Designer in writing at the time the shop drawings are submitted, stating the difference in value between the Contract requirements and that denoted by said shop drawings.

6. The General Contractor shall assume full liability for delay attributed to insufficient time for delivery and/or installation of material or performance of the work when approval of pertinent shop drawing is withheld due to the failure of the General Contractor to submit, revise, or resubmit shop drawings in adequate time to allow the Designer and the UMA Project Manager a reasonable time, not to exceed twenty-one (21) calendar days, for normal checking and processing of each submission or resubmission.

C. Coordinate each submittal with requirements of Contract Documents.

D. The General Contractor's responsibility for errors and omissions in submittals is not relieved by the Designer’s review and approval of submittals, unless Designer gives tentative written acceptance of specific deviations identified as such by the General Contractor, subject to written concurrence by the UMA Project Manager.

E. Notify the Designer in writing at the time of submission, of deviations in submittals from requirements of Contract Documents or previous submissions.

F. Work that requires submittals shall not commence unless submitted with Designer’s stamp and initials or signature indicating review and approval, and UMA Project Manager’s initials or signature of concurrence indicate review and approval.

1. No work shall be started in the shop or on the job, or materials delivered to the site, until pertinent shop drawings have been approved by the Designer and the UMA Project Manager.

G. After aforesaid review and approval, distribute copies.

H. Maintain one (2) copies of each approved submittal at the project site. One for the General Contractor and one for the UMA resident.

1.5 SUBMISSION REQUIREMENTS:

A. General: All submittals shall be made to the Designer’s Office. The quantity and make-up of submittals shall be as established by the Designer; however, two (2) additional copies of all submittals shall be transmitted to the UMA Project Manager at the same time that such submittals are transmitted to the Designer. The Designer will log and distribute submittals for review by his consultant engineers. The General Contractor shall distribute all Civil, Structural, and MEP shop drawings directly to the Designer. All submittals shall be in both hard and electronic copies.
B. Make submittals promptly in accordance with approved schedules, and in such sequence as to cause no delay in the work.

C. Submit number of samples specified in each Section of the Specifications.

D. Submittals shall include:

1. Date and revision dates.
2. Project title and number.
3. The names of:
   a. Designer;
   b. General Contractor;
   c. Subcontractor;
   d. Supplier;
   e. Manufacturer;
   f. Separate detailer when pertinent.
4. Identification of product or material.
5. Location of work and relation to adjacent structure or materials.
6. Field dimensions clearly identified as such.
7. Specification Section number and specific paragraph under which item is specified.
8. Submission number.
9. Applicable standards, such as ASTM number.
10. A blank space, five-inch by four-inch, for the Designer’s stamp.
11. General Contractor’s remarks. Identify exceptions or deviations from Contract Documents and reasons for them.
   a. If shop drawings submitted by the General Contractor indicate a departure from the Contract and the Designer deems it to be minor adjustment in the interest of UMA (subject to concurrence by the General Contractor stating it does not involve a change in Contract Price or extension of time), the Designer may approve the submission, but the approval shall be subject to UMA review and acceptance of the Designer’s recommendation.
   b. The approval of UMA shall be inferred to contain in substance the following: The change is so ordered with the understanding that it does not involve any change in the Contract Price or Time, and that it is subject generally to all contract stipulations and covenants, and is without prejudice to any and all rights of UMA under the Contract.
12. General Contractor's stamp, initialed or signed certifying review and approval of submittal.
13. Any other items as called for by the Designer, the UMA Project Manager or required by the manufacturers.
14. The Designer reserves the right to ask for shop drawings for any or all items on the project, whether or not requested in individual specification sections, at no additional cost to the Commonwealth.

1.6 RESUBMISSION REQUIREMENTS:

A. Resubmission: Resubmission procedure shall follow the same procedures as the initial submittal with the following exceptions:

B. Shop Drawings:
1. Transmittal shall contain the same information as the first transmittal except that the submission number shall change sequentially. The drawing number/description shall be identical as the first transmittal but the date shall be the revised date for that submission.

2. No new material should be included on the same transmittal for the resubmission.

3. Indicate on drawings any changes which may have been made other than those requested by the Designer.

C. Product Data and Samples:

1. Submit any new data and samples as required from previous submittal.

1.7 THE UMA PROJECT MANAGER’S AND DESIGNER’S REVIEWS AND DISTRIBUTION OF SUBMISSIONS

A. The UMA Project Manager and/or his/her designees will review submittals concurrently with the Designer and his/her consultant engineers. The Designer and the UMA Project Manager shall communicate within the aforesaid review period time frame (21 calendar days). The time frame for the Designer’s review will not exceed fourteen (14) calendar days between her/his receipt of submittal and contacting the UMA Project Manager. After the Designer’s (and his/her consultant engineers) review, distribution shall be as stated herein.

1. If submittal is ‘reviewed - no exceptions taken’, or ‘reviewed, make corrections noted’, the UMA Project Manager shall compose a transmittal indicating the status. The UMA Project Manager will then return one (1) copy of the submittal together with the transmittal to the Designer, and shall retain one (1) copy for her/his records. The Designer shall copy and attach the UMA Project Manager’s transmittal to each submittal, stamp the submittals in concurrence with the status agreed to, and transmit back to the General Contractor, with one (1) copy sent directly to the UMA Resident Engineer. The General Contractor shall then distribute said submittals to appropriate Subcontractors, and one (1) copy to the UMA Resident Engineer.

2. If submittal is ‘reviewed - revise and resubmit’ or ‘rejected’, the UMA Project Manager shall compose a transmittal indicating the status. The UMA Project Manager will then return one (1) copy of the submittal together with the transmittal to the Designer, and shall retain one (1) copy for her/his records. The Designer shall copy and attach the UMA Project Manager’s transmittal to each submittal, stamp the submittals in concurrence with the status agreed to, and transmit back to the General Contractor for resubmission. A copy of the transmittal, indicating that a submittal was disapproved and returned to the General Contractor, will be forwarded from the Designer to the UMA Project Manager with an additional copy forwarded from the Designer to the UMA Resident Engineer, for their records.

3. If a submittal is ‘reviewed - no exceptions taken’ or reviewed, make corrections noted’ by the Designer, or approved as noted by the Designer, but the UMA Project Manager does not concur, a meeting between the Designer and the UMA Project Manager will immediately be established to resolve the impasse within the overall review period time frame (21 calendar days). The UMA Project Manager will have final authority as to the disposition of the submission. The Designer’s position of approval (or disapproval) must be based on the contractual criteria of design intent, function, structure, and durability. The UMA Project Manager’s contrary position must also be based on these criteria.

4. The combined review period, for the Designer and the UMA Project Manager, will not exceed twenty-one (21) calendar days from the established date of each submission.
indicated on the Schedule of Shop Drawings, Product Data and Samples, plus the additional time, if any, for distribution by the General Contractor and receipt of submissions by the Designer and UMA Project Manager. The General Contractor is required to anticipate review time, including time for possible rejection and resubmission, in establishing Schedule dates.

a. The aforementioned time provided the Designer for checking shop drawings is from the date of receipt of shop drawings by the Designer to the mailing date of shop drawings returned to the General Contractor by the Designer.

5. The Designer will process the submission and indicate the appropriate action on the submission and the transmittal. Incomplete or erroneous transmittals will be returned without action.

6. The Designer will fill out transmittal in the following sequence:
   a. Date received from General Contractor.
   b. Date forwarded to UMA Project Manager.
   c. Date received from UMA Project Manager.
   d. Date returned to General Contractor.
   e. Action taken on submission.
   f. Distribution, including number of copies distributed and type of material distributed (i.e., print, brochure or sample, etc.).
   g. Designer’s remarks (note major deviations from the Contract Documents).

B. Designer’s Review Procedure:

1. Stamped REVIEWED, “NO EXCEPTIONS TAKEN”:
   a. No corrections or resubmissions required, fabrication may proceed.

2. Stamped REVIEWED, “MAKE CORRECTIONS NOTED”:
   a. If General Contractor complies with noted corrections, fabrication may proceed. Submit corrected print for final review.
   b. If, for any reason, the General Contractor cannot comply with the noted corrections, fabrication shall not proceed and General Contractor shall resubmit, following procedures outlined in this Section.

3. Stamped REVIEWED, “REVISE AND RESUBMIT” OR “REJECTED”:
   a. General Contractor shall revise and resubmit for review. Fabrication shall not proceed.

C. Manufacturer’s Instruction

1. When required in individual Specification Section, submit manufacturer’s printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for product data., with two (2) additional copies submitted to the UMA Project Manager and one (1) copy to the UMA Resident Engineer.

D. Certificates of Compliance: Submit certificates of compliance with the associated Shop Drawings, Product Data, and Samples required for the product in quantities specified for certificates of compliance, with two (2) additional copies submitted to the UMA Project Manager and one (1) copy to the UMA Resident Engineer.

E. Field Samples: Provide field samples of finishes at the project as required by individual Specification Section. Install sample complete and finished.
F. Patterns and Colors: Submit accurate color charts and pattern charts to the Designer for review and selection whenever a choice of color or pattern is available in a specified product, unless the exact color and pattern of a product are indicated in the Contract Documents. Color and Pattern charts shall represent the manufacturer’s complete standard offerings, except where Specifications limit the offerings by defining a particular series or product type which is normally limited in color and pattern availability. Color and Pattern charts shall be submitted in quantities specified with two (2) additional copies submitted to the UMA Project Manager and one (1) copy to the UMA Resident Engineer.

1.8 SCHEDULE OF VALUES

A. Prior to the first request for payment, the General Contractor shall submit to the Designer and the UMA Project Manager, a Schedule of Values of the various portions of the Work in sufficient detail to reflect various major components of each Subcontractor, including quantities when requested, aggregating the total contract sum, and divided so as to facilitate payments for work under each Section. The schedule shall be prepared in such form as specified or as the Designer or the UMA Project Manager may approve, and it shall include data to substantiate its accuracy. Each item in the Schedule of Values shall include its proper share of overhead and profit. This schedule, including breakdown and values, requires the approval of the Designer and the UMA Project Manager and shall be used only as a basis for the General Contractor's request for payment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
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 that are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Furnishing all labor, materials, and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operation under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water, and land, and involves management of runoff, dust, noise, and solid waste, as well as other pollutants. Work shall include installing, maintaining, and removing sedimentation and erosion control components within the Limits of Work.

1.3 SECTION INCLUDES

A. Applicable Regulations

B. Notifications

C. Protection of Groundwater

D. Protection of Streams And Wetlands

E. Protection of Land Resources

F. Protection of Air Quality

G. Maintenance of Pollution Control Facilities During Construction

H. Noise Control

I. Diesel Equipment Emission Controls

J. Spill And Discharge Control
1.4 RELATED SECTIONS

A. Section 015000 - TEMPORARY FACILITIES AND CONTROLS.

B. Section 024100 - DEMOLITION.

1.5 APPLICABLE REGULATIONS

A. The General Contractor shall comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

B. Fines and related costs resulting from failure to provide adequate protection against any environmentally objectionable acts and corrective action to be taken are the obligations of the General Contractor.

1.6 NOTIFICATIONS

A. UMA Project Manager may notify the General Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements may notify the General Contractor in writing, through UMA Project Manager, of any non-compliance with State or local requirements. After receipt of such notice from UMA Project Manager or from the regulatory agency through UMA Project Manager, the General Contractor shall immediately take corrective action. Such notice, when delivered to the General Contractor or his/her authorized representative at the site of the Work, shall be deemed sufficient for the purpose. If the General Contractor fails or refuses to comply promptly, UMA Project Manager may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the General Contractor unless it is later determined that the General Contractor was in compliance.

PART 2 - PRODUCTS

2.1 WATER

A. Water used for dust control and equipment washes shall be clean and free of salt, oil, and other injurious materials. The General Contractor shall provide all necessary water.

2.2 ONSITE SPILL KIT

A. The General Contractor shall provide the following minimum equipment to be kept onsite at all times during site work activities for any unexpected spills or discharges:

1. Sand, clean fill and absorbent pillows,
2. Four drums (55 gallon, U.S. DOT 17-E or 17-H),
3. Shovels, and
4. Steam cleaner for decontamination of tools and equipment.
PART 3 - EXECUTION

3.1 PROTECTION OF GROUNDWATER

A. Care shall be taken to prevent, or reduce to a minimum, any discharges to the ground of liquids that may infiltrate to the underlying groundwater or enter on-site waterways. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the groundwater or waterway shall not be discharged from the Site. Such waters shall be collected and disposed of by the General Contractor in accordance with all applicable Federal, State and local regulations.

3.2 PROTECTION OF STREAMS AND WETLANDS

A. Care shall be taken to prevent, or reduce to a minimum, any damage to any wetland from pollution by debris, sediment, or other material. Manipulation of equipment and/or materials in delineated wetland areas is prohibited. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in downstream waters of the State, shall not be discharged from the Site. Such waters shall be collected and disposed of by the General Contractor in accordance with all applicable Federal, State and local regulations.

3.3 PROTECTION OF LAND RESOURCES

A. Land resources within the project boundaries and outside the limits of permanent work shall be restored to a condition, after completion of remediation activities that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to Limits of Work areas shown on the Drawing.

B. Outside of the Limits of Work as shown on the Drawing, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. Snow fence or other approved equal shall be erected at the “fall line” of the tree canopy, and no vehicles or storage will be permitted within, to prevent damage to trees.

C. The locations of storage and other facilities, required in the performance of the Work, shall not be within wetlands or resource areas.

3.4 PROTECTION OF AIR QUALITY

A. Burning – The use of burning at the project site for the disposal of refuse and debris will not be permitted.

B. Dust Control – Maintain all demolition excavations, stockpiles, waste areas, and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded (MADEP 310 CMR 7.09.-7.10) and which would cause a hazard or nuisance to others.

C. The General Contractor shall provide adequate means for the purpose of preventing dust and odor caused by construction operations throughout the period of the construction contract. If UMA Project Manager or the Designer indicates that the level of dust or odors is unacceptable, the General Contractor shall employ measures necessary to reduce dust or odors to an acceptable level.
D. The General Contractor shall implement engineering controls (e.g. watering, misting) to control dust whenever required by the Designer or UMA Project Manager.

3.5 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. During the life of this Contract, maintain all facilities constructed for pollution, erosion, and sedimentation control as long as the operations creating the particular pollutant area being carried out.

3.6 NOISE CONTROL

A. The General Contractor shall develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum. Local noise ordinances shall govern.

B. The General Contractor shall execute construction work by methods and by use of equipment which will reduce excess noise.

C. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

D. The General Contractor shall manage vehicular traffic and scheduling to reduce noise.

3.7 DIESEL EQUIPMENT EMISSION CONTROLS

A. All motor vehicles and construction equipment shall comply with all pertinent local, state, and federal regulations covering exhaust emission controls and safety.

B. All General Contractor and Subcontractor diesel-powered non-road construction equipment with engine horsepower (HP) ratings of 50HP and above, which are used on the Project Site for a period in excess of 30 calendar days over the course of the construction period on the Project Site, shall be retrofitted with Emission Control Devices in order to reduce diesel emissions.

C. The reduction of emissions of volatile organic compounds (VOCs); carbon monoxide (CO) and particulate matter (PM) from diesel-powered equipment shall be accomplished by installing Retrofit Emission Control Devices.

D. Acceptable Retrofit Emission Control Devices for the Project shall consist of oxidation catalysts or other comparable technologies that are (1) included on the US Environmental Protection Agency (EPA) Verified Retrofit Technology List and/or the California Air Resources Board Currently Verified Technologies List; and (2) are verified by EPA or CARB, to provide a minimum emissions reduction of 50 percent for VOCs, 40 percent for CO and 20 percent for PM. Attainment of the required reduction in PM emissions can also be accomplished by using less polluting Clean Fuels. Verified technologies can be identified on the following websites:

   EPA: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm

   CARB: http://www.arb.ca.gov/diesel/verdev/verifiedtechnologies/cvt.htm

E. The emission control equipment can be procured through the Statewide Contract #VEH71 that has fixed costs associated with retrofitting of diesel emission control devices. The following are the vendors listed on the State-wide Contract:

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1) Cummins Northeast, Inc.
   Contact: Scot Lengel
   Telephone Number: 781-329-1750
   E-Mail Address: Scot.L.Lengel@cummins.com

2) Patriot International Trucks, LLC/Anderson International Trucks of Boston
   Contact: John Anderson, Jr.
   Telephone Number: 800-277-4777
   E-Mail Address: john@andersonmotors.com

3) Clean Diesel Technologies, Inc.
   Contact: Glen Reid
   Telephone Number: 203-327-7050
   E-Mail Address: greid@cdti.com

F. Construction shall not proceed until the General Contractor has submitted a certified list of the non-road diesel-powered construction equipment subject to this specification which either are or will be retrofitted with emission control devices. The list shall include (1) the equipment number, type, make, and General Contractor/Subcontractor name; and the emission control device make, model, and EPA verification number. General Contractors shall also submit a receipt or other documentation from a manufacturer or installer that verifies that appropriate equipment has been installed. The General Contractor shall also identify any vehicles that will use Clean Fuels. Equipment that has been retrofitted with an emission control device shall be stenciled or otherwise clearly marked as "Low Emission Equipment".

G. The General Contractor shall submit monthly reports, updating the same information stated in Paragraph F above, including the quantity of Clean Fuel utilized. The addition or deletion of non-road diesel equipment shall be indicated in the report.

H. The General Contractor shall use methods to control nuisance odors associated with diesel emissions from construction equipment including but not limited to the following: (1) turning off diesel combustion engines on construction equipment not in active use and on trucks that are idling for five minutes or more; and (2) locating diesel equipment away from the general public and sensitive receptors.

I. All costs associated with implementation of the diesel equipment emissions control shall be borne by the respective General Contractor or Subcontractor and included in their cost for performing the work of the Contract.

3.8 SPILL AND DISCHARGE CONTROL

A. The General Contractor shall provide equipment and personnel to perform emergency measures required to contain any spillage and to remove spilled materials and soils or liquids that become contaminated due to spillage. The collected spill material shall be properly disposed of at the General Contractor's expense.
B. Costs to provide the above spill and discharge control materials shall be included in the contract base bid price.

END OF SECTION
SECTION 014000
QUALITY REQUIREMENTS

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 REQUIREMENTS INCLUDED

A. General Contractor’s Quality Assurance.
B. General Contractor’s Testing Responsibilities.
C. UMA’s independent agencies.
D. Duties of the General Contractor’s testing agencies.
E. Welding.
F. Field engineering.
G. Examination of substrate.
H. General Contractor’s Quality Assurance and Quality Control Plan.

1.3 RELATED SECTIONS

A. Section 013100 – PROJECT MANAGEMENT AND COORDINATION:
   1. General project management and coordination.
B. Section 014325 – TESTING AGENCY SERVICES:
   1. Testing to be performed by the Owner’s Independent Testing Laboratory, exclusive of testing to be performed by the General Contractor.

1.4 GENERAL CONTRACTOR’S QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing services agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of
Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

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 GENERAL CONTRACTOR’S TESTING RESPONSIBILITIES

A. The General Contractor shall provide inspections, tests and quality control services specified in individual specification Sections and required by governing authorities, except where they are specifically indicated to be solely the responsibility of a Subcontractor in the respective specification section or solely the responsibility of UMA.

B. Engage and pay for the services of an independent agency acceptable to the UMA Project Manager to perform the specified inspections, testing, and quality control. Submit qualifications to the UMA Project Manager. General Contractor’s testing agency/laboratory shall be licensed by the Commonwealth of Massachusetts Department of Public Safety.

C. Re-testing: The General Contractor is responsible for re-testing where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Documents requirements, regardless of whether the original test or service was the General Contractor’s responsibility.

D. Substitutions, Suspicious Issues and Designer Initiated Testing: The General Contractor is responsible for inspections, tests and similar services for substitutions, suspicious issues identified by the General Contractor or UMA Project Manager, and testing initiated by the Designer.

E. Associated Services: The General Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as required. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

1. Provide access to the work and furnish incidental labor and facilities necessary to facilitate inspections and tests.
2. Take adequate quantities or representative samples of materials that require testing or assist the agency in taking samples.
3. Provide facilities for storage and curing of test samples and delivery of samples to testing laboratories.
4. Provide the agency with a preliminary design mix proposed for use for material mixes that require control by the testing agency.
5. Provide security and protection of samples and test equipment at the project site.

F. The General Contractor shall prepare and submit to the UMA Project Manager for approval a Quality Assurance and Quality Control Plan within 30 days from Notice to Proceed. A Quality Assurance and Quality Control (QA/QC) Plan shall promote completion of all work in accordance with the Contract Documents including Contract, Construction Drawings, Specifications, Project Procedures, Approved Submittals and Shop Drawings, Approved Changes, Applicable Codes and Regulations, Referenced Industry Standards, and similar items. The primary purpose of this quality plan is to ensure that all in place work by the General
Contractor and all Subcontractors is performed correctly the first time and is turned over and
represented as complete and defect free in accordance with the Contract Documents.

G. If required by the Contract, the General Contractor shall assign a dedicated Quality Assurance
and Quality Control Manager for the duration of the project. If the Contract does not require a
dedicated Quality Assurance and Quality Control Manager, the General Contractor shall prepare
and submit to the UMA Project Manager their QA/QC Plan as discussed in Par. E above. In
addition, if this Contract does not require a dedicated QA/AC Manager, the duties of the
QA/AC Manager as delineated in Par. 1.5F6 shall be carried out by another qualified member of
the General Contractor’s onsite staff.

1. The purpose of a QA/QC Manager shall be to prepare and submit the Quality Assurance
and Quality Control Plan for approval and to be responsible for and to manage adherence
to the plan throughout the construction process. The QA/QC Manager shall be
designated for the project from the initial notice to proceed through system acceptances
by both the designer and UMA Project Manager. The QA/QC Manager shall at all times
instill an expectation that all work will be completed correctly and in an expeditious
manner and shall be responsible for enforcement of the General Contractor’s Staff and all
Subcontractors to this plan.

2. Have extensive experience in building construction, project controls, and previous
QA/QC training and practical knowledge.

3. Have excellent communication and writing skills, be highly organized and be able to
work with both management and Subcontractors.

4. Have a working knowledge of project scheduling.

5. The General Contractor shall submit substantiating documentation attesting to the
proposed QA/QC Manager’s capabilities to the UMA Project Manager and the Designer
for approval.

6. Duties of the QA/QC Manager:
   a. Prepare and submit QA/QC Plan for approval.
   b. Conduct and submit minutes for all requisite Quality Meetings.
   c. Coordinate and report on all daily quality activities.
   d. Verify accurate documentation by Subcontractors and Vendors.
   e. Work with UMA Commissioning Agent.
   f. Oversee final project records pertaining to quality.
   g. Report, photograph and distribute evidence of deficient and/or defective
      construction conditions or materials that cannot be corrected within three work
      days of observation. When such conditions or materials are remedied report,
      photograph and distribute evidence of remedial work prior to concealing.
      Photographs shall be dated and defects and/or deficiencies shall be clearly labeled
      on the photographs.

1.6 UMA’S INDEPENDENT TESTING AGENCIES

A. UMA will engage an independent testing agency at its own expense to perform certain tests and
similar services as set forth in Section 014325. Information provided by UMA’s Independent
Testing Agency shall be for the sole use of UMA's Project Manager, and shall not 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.

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B. It is the General Contractor’s responsibility to provide and pay for its own inspection and testing to assure quality control. General Contractor shall be responsible for coordinating its work with requirements of UMA’s testing agencies, and shall provide reasonable services in support of facilitating work of UMA’s testing agencies as required.

1.7 DUTIES OF THE GENERAL CONTRACTOR’S TESTING AGENCIES

A. The General Contractor’s independent testing agency engaged to perform inspections, sampling and testing of materials and construction shall cooperate with the Designer and General Contractor in performing its duties, and shall provide qualified personnel to perform required inspections and tests.

B. The testing agency shall notify the Designer and General Contractor promptly of irregularities or deficiencies observed in the work during performance of its services.

C. The testing agency shall not perform any duties of the General Contractor.

D. The General Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.8 GENERAL CONTRACTOR’S QUALITY CONTROL REQUIREMENTS, GENERAL

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of the quality as specified.

B. Comply fully with manufacturer's instructions, including each step in sequence.

C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

D. Perform work by persons qualified to produce workmanship of specified quality.

E. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortions, or disfigurement. Anchorage devices shall be labeled to allow for visual inspection and verification of type of anchorage device.

1.9 WELDING

A. Certified Welders:

1. Structural welds shall be made only by operators who have been qualified by tests, as prescribed in the "Standard Qualification Procedure" of the American Welders Society, to perform the type of work required. Operators shall be certified welders; certification must be shown to the Resident Engineer and must be current. Provide a copy of certification(s) to the UMA Resident Engineer.

2. Pipe welds shall be made by operators who have been qualified by the National Certified Pipe Welding Bureau and each operator's qualification record shall be submitted to the
Designer before any work is performed. Welders' certification card must be shown to the Resident Engineer. Provide a copy of certification(s) to the UMA Resident Engineer.

3. Shop welding shall be in accordance with the "Code for Welding in Building Construction."

4. Welders shall provide their own portable generating equipment for electric welding. Use of the Commonwealth's electrical system for welding will not be permitted.

B. Welding and Cutting:

1. Where electric or gas welding or cutting work is done above or within ten (10) feet of combustible material or above a space that may be occupied by persons, use interposed shields of incombustible material to protect against fire damage or injury due to sparks and hot metal.

2. Place tanks supplying gases for gas welding or cutting at no greater distance from the work than is necessary for safety, securely fastened and maintained in an upright position in accordance with applicable codes. Store such tanks in a locked enclosure remote from any combustible material and free from exposure to the rays of the sun or high temperatures.

3. Maintain suitable fire extinguishing equipment near all welding and cutting operations. When operations cease for the noon hour or at the end of the day, thoroughly wet down the surroundings adjacent to welding and cutting operations.

4. Station a workman equipped with suitable fire extinguishing equipment near welding and cutting operations to see that sparks do not lodge in floor cracks or pass through floor or wall openings or lodge in any combustible material. Keep the workman at the source of work which offers special hazards for thirty (30) minutes after the job is completed to make sure that smoldering fires have not been started.

5. Place a qualified electrician in charge of installing and maintaining electric and arc welding equipment. Remove damaged electric, arc or gas welding equipment from the site.

1.10 MANUFACTURER'S REPRESENTATIVES

A. If required by specific Specification Sections, manufacturer's representative shall be present at the job site for supervision of work during installation of materials. Such representative shall be present during all aspects of construction to ensure proper installation of all applicable items. Refer to other sections of these specifications for additional requirements.

1.11 FIELD ENGINEERING

A. Survey work through the course of all phases of construction shall conform to the following guidelines:

1. General Contractor shall employ a competent Civil Engineer or Land Surveyor, registered in the Commonwealth of Massachusetts, who will establish permanent benchmarks. Maintain all established bounds and benchmarks and replace as directed any which are destroyed or disturbed.

2. Prior to the installation of permanent construction (foundations, slab-on-grade, utilities, etc.) General Contractor shall provide a certification signed by Engineer/Surveyor.
warranting the principal lines, levels, and overall dimensions are accurately established in accordance with the Contract Documents.

3. Establish all lines and grades for the work, and verify all locations, property lines, work lines and other dimensioned points indicated on the Drawings for the project site.

4. Submit to the Designer a written confirmation of locations of all lines, and any discrepancies between conditions and locations as they actually exist and those indicated on the Drawings. General Contractor shall not commence any excavation or construction work until verification has been received and approved by the Designer. Upon receipt of approval from the Designer, provide one (1) copy of that approval to the UMA Resident Engineer.

5. General Contractor shall be held responsible for any damage incurred thereby to UMA, due to incorrect laying out of the work. In the event that errors or discrepancies are discovered on the Drawings, the General Contractor shall immediately notify the Designer and no further work shall be performed until the discrepancy has been corrected by the Designer.

1.12 EXAMINATION OF SUBSTRATE

A. Installers of materials, products or equipment shall:

1. Examine base surfaces upon which materials, products or equipment are to be installed.
2. Examine conditions upon which materials, products or equipment are to be installed.
3. Where there is any question as to the dryness of a surface, test with a modern moisture-indicating machine.
4. Notify the General Contractor, in writing, with a copy to the Designer, if conditions are detrimental to proper and timely construction and completion of the work.

B. Do not proceed with work until unsatisfactory substrate, or not acceptable conditions have been corrected. Commencement of installation constitutes acceptance of substrate or base surfaces, and the cost of any corrective work due shall be borne by the installer applying his/her materials, products or equipment thereon.

1.13 GENERAL CONTRACTOR’S QUALITY ASSURANCE AND QUALITY CONTROL PLAN

A. The General Contractor’s Quality Assurance and Quality Control Plan shall instill an expectation that all work will be completed correctly and in an expeditious manner. In all instances the General Contractor shall be responsible for the adherence to and enforcement of the General Contractor’s Staff and all Subcontractors to this plan.

1. Submit the General Contractor’s Quality Assurance and Quality Control Plan to the UMA Project Manager within 30 days from the Notice to Proceed. Submit in format acceptable to UMA’s Project Manager. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out General Contractor's quality-assurance and quality-control responsibilities. Coordinate with General Contractor's construction schedule.

B. The Plan shall include specific procedures for conducting formalized inspections of predetermined selected work items at the time the General Contractor first starts new work. These inspections are performed by a designated QA/QC Inspection Team composed of
authorized representatives from UMA, the General Contractor, A/E, Subcontractor(s) (whose work is being inspected) and others as may be required.

C. The Quality Assurance and Quality Control Plan shall be created as a General Contractor Project Specific Quality Plan addressing at a minimum the following components:

1. Quality meetings.
   a. Pre-construction conference.
   b. Pre-installation review meetings.
   c. Coordination meetings.
2. Regular Daily Inspections.
4. First Delivery of Material / Equipment Inspections.
5. First Equipment in Place Inspections.
6. Mock-up Inspections.
7. Bench Mark Inspections.
8. Follow-Up Bench Mark Inspections.
9. Below Grade / In-Wall and Above Ceiling Inspections.

D. Quality Meetings:

1. Pre-construction Conference:
   a. A conference held to discuss all aspects of the construction project such as the schedule, payment procedures, change order procedures and much more. This meeting is held immediately after contract award.
   b. The UMA Project Manager, Designer, Design Consultants, General Contractor and Subcontractors will attend these meetings.
2. Pre-Installation Review Meetings:
   a. A review meeting shall be held for certain kinds of work requiring special coordination efforts between Subcontractors, a better understanding of how the work is to be performed by one or more Subcontractors, sequencing of work between the Subcontractors, or a review of special requirements pertaining to the work to be performed. This type of meeting is conducted just prior to starting the actual work. The meeting is scheduled and run by the General Contractor on an as needed basis.
   b. The UMA Project Manager, Designer, General Contractor and all applicable Subcontractors will attend these meetings.
   c. The General Contractor’s Staff and Subcontractor’s actual supervisory people who will be performing the work in the field are to attend these meetings.
   d. Safety precautions relating to the work to be performed are also to be discussed as part of this meeting.
3. Coordination Meetings:
   a. The General Contractor shall conduct project Coordination Meetings at regular intervals. Project Coordination Meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings. An example would be regularly scheduled MEP coordination meetings to monitor the progress of the MEP coordination process.
   b. General Contractor shall request representation by every party currently involved in coordination or planning for the construction activities involved.
c. General Contractor shall record meeting results and distribute copies to everyone in attendance and others affected by decisions or actions resulting from each meeting. The UMA Project Manager and the Designer are to be on the Distribution List.

E. Regular Daily Inspections:

1. The General Contractor will monitor the quality of the in-place construction work daily, to ensure that it complies with the requirements of the Contract Documents, Pre-Construction Meetings, Pre-Installation Meetings and Coordination Meetings.
2. The General Contractor shall log, record and distribute daily record of quality monitoring as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action.
3. The QA/QC Inspection Team will inspect work periodically based on observations noted in General Contractor’s reporting to verify completion and compliance.

F. Building Exterior Envelope Review:

1. UMA will engage and pay for an independent testing firm to perform a review of the exterior envelope building design.
2. The design review will be performed by an independent consulting firm experienced with this type of work.
3. The scope of services for the building exterior envelope review shall include a documented review of the exterior building envelope design details and specifications, review of proposed product and material submittals prior to material acquisition, and on-site quality control inspections as deemed appropriate by the General Contractor and UMA Project Manager.
4. Physical inspections shall include on-site meetings with project personnel, including the UMA Project Manager, Designer, General Contractor and Subcontractors at various stages of installation.
5. The scope of the building envelope inspection, or review, should include, but is not limited to exterior building materials, flashings, bracing, anchors, weep holes and other water removal systems from within cavity walls, roofing systems, caulking and other sealants, parapet wall cap details, mullion details at openings, waterproofing below grade, and other abutting materials or systems.
6. The General Contractor will coordinate with and support the exterior envelope review inspections to include coordination of first delivery inspections, mock-ups and benchmarks called for within envelope system or specific materials specifications to which the design review of this section may apply.

G. First Delivery of Material/Equipment Inspection:

1. The General Contractor shall manage and keep current an anticipated delivery schedule for all materials and equipment to be delivered to the site and provide regular updates or upon request to the UMA Project Manager and QA/QC Inspection Team.
2. The General Contractor shall log, record and distribute any account on the first delivery of each type of material or equipment as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action.
3. First deliveries will be verified against the requirements of the design documents and the approved submittals. Nonconforming materials and/or equipment will not be allowed to be set into place and will be removed from the site.
4. This inspection establishes the basis for judging all future deliveries of like material/equipment.

H. First Equipment In Place Inspection:
   1. The General Contractor shall manage and keep current an anticipated schedule for all materials and equipment to be inspected in place and provide regular updates or upon request to the UMA Project Manager and QA/QC Inspection Team.
   2. General Contractor and QA/QC Inspection Team will inspect and document the first setting of equipment to verify it is in conformance with the requirements of the Contract Documents.
   3. The installation and assembly will be verified against the requirements of the design documents and the approved shop drawings.
   4. The General Contractor shall log, record and distribute any account for each type of first in place equipment inspection as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action or pending inspection.
   5. Upon acceptance of the equipment in place, the General Contractor can proceed with permanently anchoring it into place by the means prescribed in the Contract Documents.
   6. This inspection establishes the basis for judging all future setting of like equipment.

I. Mock-Up Inspections:
   1. The General Contractor will note all Mock-Ups required by the Contract Documents and include the activity in their construction schedule and submit for review and approval of the UMA Project Manager, the Designer and the QA/QC Inspection Team.
   2. The General Contractor shall log, record and distribute any account of Mock-Up(s) as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up, and inspection.
   3. General Contractor will benchmark each work type within the Mock-Up for conformance with the requirements and review with the QA/QC Inspection Team.
   4. The QA/QC Inspection Team shall review, comment that the work appears in conformance to the requirements. Comments are documented and distributed by the General Contractor. Non-conforming work will be corrected at no additional cost to UMA.
   5. The approved Mock-Up establishes a basis for judgment for all later like construction.
   6. The Mock-Up process and inspection(s) does not take away from the responsibility of the General Contractor and installing contractors to provide a finished and fully functioning product and to maintain the construction schedule.

J. Benchmark Inspections (In Sequence Work):
   1. The General Contractor in consultation with the UMA Project Manager, Designer and QA/QC Inspection Team will establish which work will be scheduled for benchmarking during the normal course of construction.
   2. The General Contractor shall log, record and distribute any account of Benchmark(s) as a component of daily reporting and provide notification on a regular basis during
construction of currently observed items in process, requiring corrective action, or follow
up, and that require inspection.
3. General Contractor shall note that the work to be inspected has been started and if found
to be acceptable shall call for a benchmark inspection to be conducted by the QA/QC
Inspection Team.
4. The QA/QC Inspection Team shall review, comment that the work appears in
conformance to the requirements. Comments are documented and distributed by the
General Contractor. Non-conforming work will be corrected at no additional cost to
UMA.
5. This inspection establishes the basis for judging all future work of a like type, none of
which shall commence until the benchmark is approved.
6. The Benchmark process and inspection(s) does not take away from the responsibility of
the General Contractor and installing contractors to provide a finished and fully
functioning product and to maintain the construction schedule.

K. Follow-Up Benchmark Inspections:
   1. The General Contractor shall ensure that all subsequent work being built of the same type
of work that was previously benchmarked will be built in conformance to the
Benchmarked work without deviation.
   2. The General Contractor and QA/QC Inspection Team will randomly inspect subsequent
work being built of the same type of work that was previously benchmarked to ensure the
work is being built in conformance with the benchmarked work.
   3. The General Contractor shall log, record and distribute any account of follow-up
benchmark(s) as a component of daily reporting and provide notification on a regular
basis during construction of currently observed items in process, requiring corrective
action, or follow up, and that require inspection.

L. Below Grade / In Wall and Above Ceiling Inspections:
   1. It is the intent of this section to mandate inspection of as much of the work that is to be
enclosed before it has been covered over to avoid having to reopen closed spaces to
complete or correct work therein.
   2. The General Contractor shall verify that all work is complete within the concealed space
and is ready to be inspected before it is enclosed.
   3. The General Contractor and all Subcontractors who have work installed within the work
area shall sign a closure form stating that their work has been completed and has been
inspected by all applicable code officials. General Contractor will be responsible for all
costs to have the space reopen later to complete or correct any work within the space,
and to have the space closed again, including all costs incurred for any schedule impacts
due to this work.
   4. Photographs of areas to be permanently enclosed will be taken by General Contractor and
retained as a part of the project record.
   5. The General Contractor shall log, record and distribute account of below grade, in wall or
above ceiling inspections as a component of daily reporting and provide notification on a
regular basis during construction of currently observed items in process, requiring corrective
action, or follow up.
   6. No closure or covering of work shall proceed until all requirements are met and approval
given by the QA/QC Inspection Team where such inspections are to be conducted.
M. Utility Activation and Start-Up Inspection Procedures for Equipment/Systems Prior to Validation. Refer also to Section 018100 - COMMISSIONING for additional requirements.

1. Activation Inspection:
   a. The Activation Inspection is required when the General Contractor has verified that system work meets the contract document requirements and has completed the static installation of equipment/systems, and is ready to place it into dynamic operation for the purposes of shakedown, debugging, check-out and similar activities.
   b. The General Contractor shall log, record and distribute any account of pending activations as a component of daily reporting and provide separate individual notification at a minimum of 48 hour notice prior to the scheduled time for placing specific equipment into dynamic operation.
   c. The General Contractor will notify the QA/QC Inspection Team who will inspect the work, the surroundings and provide comment that the installation is safe and appears meets the requirements for operation.
   d. Any deficiencies noted shall be corrected immediately
   e. The General Contractor will then place the equipment/systems into operation for his use, shakedown, debugging, check-out, and similar activities.

2. Start-Up Inspection:
   a. The General Contractor will coordinate with UMA’s Commissioning Agent to ensure that start-up procedures, O&M’s, prefunctional checklists and testing, equipment manufacturer’s representation are completed and/or in place according to the approved Commissioning Plan.
   b. The General Contractor shall log, record and distribute any account of pending startups as a component of daily reporting and provide separate individual notification at a minimum of 48 hour notice prior to the scheduled time for placing specific equipment into final operation.
   c. The General Contractor shall coordinate with the QA/QC Inspection Team and UMA CA to ensure that the installation operates as required.
   d. All non-conforming work will be corrected immediately.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 014200

REFERENCES

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 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract including, but not limited to, the following:

1. UMA.
2. The Designer (the Architect-of-Record or Engineer-of-Record as applicable).
3. The UMA Project Manager.
4. The UMA Resident Engineer.
5. The General Contractor.

B. "Reviewed": When used to convey Designer's action on General Contractor's submittals, applications, and requests, "reviewed" is limited to Designer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Designer. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.
I. "Project Site": Space available for performing construction activities subject to UMA approval. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source, and have available on site for reference.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

AA Aluminum Association, Inc. (The)
AAMA American Architectural Manufacturers Association
AASHTO American Association of State Highway and Transportation Officials
ABAA Air Barrier Association of America
ACI ACI International (American Concrete Institute)
AGC Associated General Contractors of America (The)
AIA American Institute of Architects (The)
AISC American Institute of Steel Construction
AISI American Iron and Steel Institute
ALSC American Lumber Standard Committee, Incorporated
AMCA Air Movement and Control Association International, Inc.
ANSI American National Standards Institute
APA APA - The Engineered Wood Association
ARMA Asphalt Roofing Manufacturers Association
ASCE American Society of Civil Engineers
ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME ASME International
(The American Society of Mechanical Engineers International)
ASTM ASTM International
(American Society for Testing and Materials International)
AWI Architectural Woodwork Institute
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Name</th>
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<tr>
<td>AWPA</td>
<td>American Wood-Preservers’ Association</td>
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<td>AWS</td>
<td>American Welding Society</td>
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<td>BHMA</td>
<td>Builders Hardware Manufacturers Association</td>
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<td>BIA</td>
<td>Brick Industry Association (The)</td>
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<td>CDA</td>
<td>Copper Development Association</td>
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<td>CISCA</td>
<td>Ceilings &amp; Interior Systems Construction Association</td>
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<tr>
<td>CRI</td>
<td>Carpet &amp; Rug Institute (The)</td>
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<td>CSI</td>
<td>Construction Specifications Institute (The)</td>
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<tr>
<td>DHI</td>
<td>Door and Hardware Institute</td>
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<td>EPA</td>
<td>Environmental Protection Agency (United States)</td>
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<td>FM</td>
<td>Factory Mutual</td>
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<td>FMRC</td>
<td>Factory Mutual Research (Now FM Global)</td>
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<td>FSC</td>
<td>Forest Stewardship Council</td>
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<td>GA</td>
<td>Gypsum Association</td>
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<td>GANA</td>
<td>Glass Association of North America</td>
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<td>GS</td>
<td>Green Seal</td>
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<td>HPVA</td>
<td>Hardwood Plywood &amp; Veneer Association</td>
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<tr>
<td>ICRI</td>
<td>International Concrete Repair Institute, Inc.</td>
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<td>IESNA</td>
<td>Illuminating Engineering Society of North America</td>
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<td>ILI</td>
<td>Indiana Limestone Institute of America, Inc.</td>
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<td>ISO</td>
<td>International Organization for Standardization</td>
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<td>ISSFA</td>
<td>International Solid Surface Fabricators Association</td>
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<td>ITS</td>
<td>Intertek Testing Service NA</td>
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<td>LEED</td>
<td>Leadership in Energy &amp; Environmental Design (USGBC)</td>
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<tr>
<td>MFMA</td>
<td>Maple Flooring Manufacturers Association, Inc.</td>
</tr>
<tr>
<td>NAAMM</td>
<td>National Association of Architectural Metal Manufacturers</td>
</tr>
<tr>
<td>NAIMA</td>
<td>North American Insulation Manufacturers Association</td>
</tr>
<tr>
<td>NBGQA</td>
<td>National Building Granite Quarries Association, Inc.</td>
</tr>
<tr>
<td>NCMA</td>
<td>National Concrete Masonry Association</td>
</tr>
<tr>
<td>NeLMA</td>
<td>Northeastern Lumber Manufacturers' Association</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
</tr>
<tr>
<td>NFPA</td>
<td>NFPA (National Fire Protection Association)</td>
</tr>
<tr>
<td>NFRC</td>
<td>National Fenestration Rating Council</td>
</tr>
<tr>
<td>NOFMA</td>
<td>NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)</td>
</tr>
<tr>
<td>NRCA</td>
<td>National Roofing Contractors Association</td>
</tr>
<tr>
<td>NSF</td>
<td>NSF International (National Sanitation Foundation International)</td>
</tr>
<tr>
<td>NTMA</td>
<td>National Terrazzo &amp; Mosaic Association, Inc. (The)</td>
</tr>
<tr>
<td>NWWDA</td>
<td>National Wood Window and Door Association (Now WDMA)</td>
</tr>
<tr>
<td>SDI</td>
<td>Steel Deck Institute</td>
</tr>
<tr>
<td>SDI</td>
<td>Steel Door Institute</td>
</tr>
<tr>
<td>SGCC</td>
<td>Safety Glazing Certification Council</td>
</tr>
<tr>
<td>SJI</td>
<td>Steel Joist Institute</td>
</tr>
<tr>
<td>SMACNA</td>
<td>Sheet Metal and Air Conditioning Contractors' National Association</td>
</tr>
<tr>
<td>SSINA</td>
<td>Specialty Steel Industry of North America</td>
</tr>
<tr>
<td>SSPC</td>
<td>SSPC: The Society for Protective Coatings</td>
</tr>
<tr>
<td>TCA</td>
<td>Tile Council of America, Inc.</td>
</tr>
</tbody>
</table>
UL Underwriters Laboratories Inc.
USGBC U.S. Green Building Council
WCLIB West Coast Lumber Inspection Bureau
WDMA Window & Door Manufacturers Association
(Formerly: NWWDA - National Wood Window and Door Association)
WWPA Western Wood Products Association

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of current edition of Codes in the Commonwealth of Massachusetts.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 014325

TESTING AGENCY SERVICES

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 SUMMARY
A. UMA 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 UMA Project Manager deems appropriate. It is the General Contractor’s responsibility to provide and pay for its own inspection and testing. See Section 014000.

B. Refer also the list of testing below, and to individual Specification Sections for the types and frequency of testing to be performed by UMA’s independent testing laboratory.

1.3 RELATED SECTIONS
A. GENERAL CONDITIONS
1. Inspections and testing required by laws, ordinances, rules, regulations, or orders of public authorities.

B. Section 014000 – QUALITY REQUIREMENTS
1. General Contractor’s responsibility for testing services to maintain quality control.

1.4 UMA TESTING AGENCY SERVICES
A. UMA testing agency services may include, but not be limited to, the following:
1. Soils; in-place and fill.
2. Piles/Piers.
3. Paving.
4. Loam and seed.
5. Concrete.
7. Masonry and mortar.
8. Steel.
10. Firestopping.
11. Roofing.
13. 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. UMA will engage and pay for the services of independent inspectors and an independent testing laboratory to perform the services specified under various Sections of the Specifications.

B. The services of a testing laboratory as specified in this Section is intended for the UMA 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 are approximate and may vary. Actual services and quantities of testing will be determined by the UMA Project Manager and the Designer during the construction period.

D. Locations for taking sample specimens for testing shall be as directed by the UMA Project Manager and the Designer-of-Record.

1.6 GENERAL CONTRACTOR’S RESPONSIBILITIES

A. Cooperate with laboratory 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 C31.

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 laboratory 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 laboratory, the General Contractor shall immediately provide copies of mill 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 laboratory 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 laboratory retained by UMA is 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 UMA Project Manager and the Designer for their approval that includes monitoring and enforcement of the quality programs of all Subcontractors. See Section 014000 Quality Requirements.

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 UMA Project Manager and the Designer-of-Record.

1.9 REPORTING OF RESULTS

A. The testing laboratory 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 laboratory shall, on a weekly basis, distribute results of all tests as follows:

1. UMA – 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
SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

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 REQUIREMENTS INCLUDED

A. Temporary Facilities and Controls including the following:
   1. Temporary Water.
   2. Weather Protection.
   3. Heating During Construction.
   4. Temporary Power.
   5. Hoisting Equipment and Machinery.
   8. Dust Control.
   10. Indoor Air Quality (IAQ) Management.
   11. Enclosures.
   12. Cleaning During Construction.
   13. Field Offices.
   15. Sanitary Facilities.
   17. Parking.
   18. Debris Control and Removal.
   22. Construction Fence.
   23. Project Identification Sign.
   25. Shut Down Notice.
   27. Covered Walkways
   28. Excavations and Field Survey Requirements

1.3 TEMPORARY WATER

A. Water will be furnished by the General Contractor up to the point indicated on the Drawings for the permanent connection to the water supply system.
B. Water shall be distributed by means of connections to the permanent service lines that are to be installed at the expense of the General Contractor.

C. Any temporary hoses and pipe lines and connections from the permanent service lines either outside or within the building, necessary for the use of the General Contractor and his Subcontractors shall be installed, protected, and maintained at the expense of the Plumbing Subcontractor.

D. Temporary hoses and temporary pipe lines used for transporting water shall not be run unattended or unprotected across parking areas, parking area entrance, walkways, plazas, or steps. Temporary hoses and temporary pipelines shall not be permitted to be installed along, through or across corridor and occupied rooms or spaces.

E. The General Contractor shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for his employees and those of his Subcontractors.

F. Use of the water may be discontinued by the Commonwealth if, in the opinion of the UMA Project Manager, it is wastefully used.

1.4 WEATHER PROTECTION

A. It is the intent of these Specifications to require that the General Contractor shall provide temporary enclosures and heat to permit construction work to be carried on during the months of November through March in compliance with M.G.L. Chapter 149, Section 44D(G). Under no circumstances shall the General Contractor suspend any work during the months of November through March because of their reluctance to provide and pay for temporary weather protection. These Specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible to protect in the judgment of the Designer. Included in the preceding category, without limitation, are such items as site work, excavation, steel erection, erection of certain "exterior" wall panels, roofing, and similar operations.

B. "WEATHER PROTECTION" shall mean the temporary protection of that work adversely affected by moisture, wind, and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the Designer and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The General Contractor shall furnish and install all "weather protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 50 degrees F. at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the General Contractor.

C. Within 30 calendar days after his award of contract, the General Contractor shall submit in writing to the Designer for approval, three copies of his proposed methods for "Weather Protection."
D. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.

E. The General Contractor shall furnish and install one accurate Fahrenheit thermometer at each work area as designated by the Designer. However, one additional accurate Fahrenheit thermometer shall be provided for every 2,000 square feet of floor space where the work areas exceed 2,000 square feet.

1.5 HEATING DURING CONSTRUCTION

A. For projects in existing buildings, heat is available for use during the project. The Contractor may use existing heaters and/or provide additional temporary heaters and connections as required. The UMA Project Manager and the Designer shall analyze the availability and potential usage of existing heat and define the project requirements in this section of the specifications.

B. Within 30 calendar days after the commencement of work under this Contract, the General Contractor shall submit in writing to the Designer for approval, three copies of his method and time schedule for heating during construction which shall concur with his general progress schedule hereto before submitted as required under Article V of the CONTRACT AND GENERAL CONDITIONS.

C. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials having a comparable resistance as the specified permanent construction. The General Contractor shall pay and provide heat therein of not less than 50 degrees F., nor more than 75 degrees F., which shall be continuously maintained in the enclosed area to the extent necessary to properly progress and protect the work until the project is accepted.

D. The General Contractor shall furnish and install one accurate recording Fahrenheit thermometer at a place designated by the Designer, and one additional accurate thermometer for every 2,000 square feet of floor space, located as directed by the Designer in order to determine if the specified temperatures are maintained. The General Contractor or his authorized agent shall furnish daily to the Resident Engineer three copies of a signed statement of temperatures recorded every three hours.

E. The General Contractor, with the approval of the Designer and UMA, may use the permanent heating system as specified for the project once it has been tested, flushed out and chemically treated, thoroughly cleaned of all construction dust and dirt, and is ready to operate. The General Contractor shall pay all energy costs for heating during construction and provide meters if required. The General Contractor and the HVAC and/or Electrical Subcontractor shall coordinate their work so that the permanent heating system for the building will be available and ready to provide heat as soon as the building is closed in. In case the Contract includes more than one building, the heating shall be provided for each building in accordance with the above provision.

F. Operating labor shall be provided for continuous direct attendance, for frequent inspection of the system, emergency repairs, and keeping of temperature records. Continuous direct
attendance shall mean direct attendance for twenty-four hours each day, seven days per week, Saturdays, Sundays and holidays included, throughout the progress of the work.

G. It shall be the sole responsibility of the General Contractor to arrange for and pay the HVAC and/or Electrical General Contractor to operate and to put in first-class condition all portions of the permanent heating system used for Heating During Construction. The Commonwealth will require the discharge of inexperienced or unsatisfactory operating labor.

H. If the system is electric heat, the foregoing requirements shall equally apply to all the comparable components thereof.

I. The installation and operation of heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection. Heating devices which may cause damage to finish surfaces shall not be used.

1.6 TEMPORARY POWER

A. For projects in existing buildings, electrical energy is available for use during the project. The UMA Project Manager and the Designer shall analyze the availability and potential usage of electrical energy and define the project requirements in this section of the specifications.

B. The utility company will provide electrical energy required for temporary light and power. The Electrical Subcontractor is required under Section 260001 - ELECTRICAL WORK, to provide temporary feeders of sufficient capacity from the local utility company, or from the institution power lines, at the point designated on the drawings, to provide for the electric light and power requirements of the Project while under construction and until the permanent feeders have been installed and are in operation. It is not the intent of the above statement to relieve the General Contractor of the responsibility of payment for energy consumed during construction, but rather to afford him use of permanent feeder, etc. for electric distribution during construction. Payment for energy consumed during construction shall be the responsibility of the General Contractor until either Use and Occupancy or Final Acceptance has occurred.

C. The General Contractor shall pay for the cost of electric energy consumed by himself and by all of his Subcontractors. Any temporary wiring of a special nature, other than that specified in Section 260001 - ELECTRICAL WORK, shall be paid for by the Subcontractor requiring it, such as:

1. Special circuits required by electric welders, elevators, lifts or other special equipment requiring high-amperage and/or special voltage service, etc.
2. Exterior lighting circuits for protection against vandalism, public warning lights, lights for advertising, and similar items.

D. The General Contractor and all Subcontractors, individually, shall furnish all extension cords, sockets, motors, and accessories required for their work. They shall also pay for all temporary wiring of construction offices and buildings used by them. The General Contractor shall pay for the offices of the General Contractor and the Resident Engineer specified in the Contract Form.

E. All temporary wiring installed by the Electrical Subcontractor shall be removed after it has served its purpose. Use copper wire only.
F. All relocations of temporary service to meet construction and/or phasing requirements shall be performed at no additional cost to the Commonwealth.

1.7 HOISTING EQUIPMENT AND MACHINERY

A. All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in safe condition by the individual Subcontractors and is so stated in each appropriately related Section of the Specifications. All costs for hoisting operating services shall be borne by the Subcontractors unless specifically excepted in the Contract Documents.

1. A licensed equipment manufacturer’s representative shall be present at all times, to witness the erection and dismantling of all hoisting equipment and machinery, whenever such equipment is being erected or dismantled. No such work will be performed without the presence of such representative.

2. Hoisting equipment and machinery erection and dismantling shall be performed only by trained, certified, and experienced riggers qualified to perform such work.

3. Copies of such licenses and/or certifications, clearly indicating qualifications, shall be provided to the UMA Resident Engineer prior to commencement of such erecting and dismantling work.

B. Review Drawings for hoisting requirements and openness of traffic access routes to installed destinations of specified equipment and furnishings.

1.8 STAGING

A. All staging, planking and scaffolding, exterior and interior, required for the proper execution of the work and over eight feet in height, shall be furnished, installed, and maintained by the General Contractor.

1. Erection and dismantling of staging shall be performed only by trained, certified, and experienced staging personnel qualified to perform such work.

2. Copies of such certifications, clearly indicating qualifications, shall be provided to the UMA Resident Engineer prior to commencement of such erecting and dismantling work.

B. All staging up to eight feet in height shall be provided by the individual Subcontractors as applicable to their work.

1.9 MAINTENANCE OF ACCESS

A. The General Contractor shall provide and maintain for the duration of his contract, a means of access to, around and within the site, as indicated on the Contract Drawings, for vehicular traffic and authorized personnel. This means of access shall be construed to sustain the weight of equipment customarily engaged for use in construction projects of this type and magnitude. The General Contractor shall, without additional compensation from the Commonwealth, furnish labor and materials as may be required from time to time to maintain this means of access in an acceptable condition as determined by the Designer. Pedestrian access shall provide adequate protection against falling debris, slippage, adequate lighting, warning and directional signs, and protection against construction activities.
1.10 DUST CONTROL

A. The General Contractor shall have all Subcontractors provide adequate means for the purpose of preventing dust caused by construction operations from creating a hazard, nuisance, and from entering adjacent occupied areas throughout the period of the construction contract.

B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the General Contractor.

1.11 NOISE CONTROL

A. Work must be scheduled and performed in such a manner as to not interfere with the operations of the Owner. Construction work that is deemed by the U.M.A. Project Manager to be excessively noisy may be required to be done during non-normal working hours and at no additional expense to the University.

B. Comply with requirements of authorities having jurisdiction. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

C. Execute construction work by methods and by use of equipment which will reduce excess noise.

1. Equip air compressors with silencers, and power equipment with mufflers.
2. Manage vehicular traffic and scheduling to reduce noise.
3. No heavy equipment may be started or idled before 7A.M.

1.12 INDOOR AIR QUALITY (IAQ) MANAGEMENT

A. Minimize exposure of building occupants, indoor surfaces, and ventilation air distribution systems to environmental tobacco smoke. At a minimum, take the following measures:

1. Prohibit smoking in the building or on campus.

B. The General Contractor shall develop a Construction Indoor Air Quality Management Plan for this Project and meet requirements of LEED EQ Cr 3.1 and 3.2.

C. During Construction: Comply with the following requirements, per LEED EQ Cr. 3.1:

1. During construction meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, Chapter 3, November 2007.
2. Protect stored on-site and installed absorptive materials from moisture damage.
3. If the UMA Project Manager authorizes the use of permanent heating, cooling, and ventilating systems during construction, install filter media having a Minimum Efficiency Reporting Value (MERV) of 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction. Replace air filters immediately prior to occupancy. Replacement air filters shall have a MERV 13 according to ASHRAE 52.2.

D. Before Occupancy: Comply with one of the following requirements, per LEED EQ Cr. 3.2:
1. Option 1 - Flush-Out (Owner-engaged indoor-air-quality testing):
   a. After construction ends, prior to occupancy and with interior finishes installed, perform a building flush-out with new Minimum Efficiency Reporting Value (MERV) 13 filtration media at 100% outside air. After the flush-out, replace the filtration media with new MERV 13 filtration media, except the filters solely processing outside air.

2. Option 2 - Air Quality Testing (General Contractor-engaged indoor-air-quality testing):
   a. Conduct a baseline indoor air quality testing procedure consistent with the United States Environmental Protection Agency’s “Compendium of Methods for the Determination of Air Pollutants in Indoor Air.”

E. Construction Indoor Air Quality Management Plan Submittal:

1. Within 21 calendar days after receipt of Notice to Proceed, the General Contractor shall submit to the UMA Project Manager a finalized Construction IAQ Management Plan.
2. The proposed Plan shall comply with requirements of LEED EQ Cr 3.1 and 3.2.
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. Schedule of emission test data recorded by General Contractor’s testing laboratory.

F. 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.

G. Immediately remove from site and properly dispose of materials showing signs of mold and mildew, including materials with moisture stains.

H. IAQ Plan Implementation:

1. IAQ Manager: The General 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.
2. Distribution: The General Contractor shall distribute copies of the Construction IAQ Management Plan to the jobsite foreman, each Subcontractor, UMA’s Project Manager, and the Designer.
3. Instruction: The General Contractor shall provide on-site instruction of appropriate procedures and methods to be used by all parties at the appropriate stages of the Project.
4. 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.
5. Remove containers and packaging from materials prior to conditioning to maximize off-gassing of VOCs.
6. Condition products in ventilated warehouse or other building.

1.13 ENCLOSURES

A. Provide temporary, insulated, weather tight closures of openings in exterior surfaces for providing acceptable working conditions and protection for materials, allowing for heating during construction, and preventing entry of unauthorized persons. Provide doors with self-closing hardware and locks.

B. All utilities including electric ducts, conduits, telephone lines, sprinklers, and other utilities shall be protected against damage from construction activity. The General Contractor shall be responsible for all damage to the utilities from construction and shall repair all such damage at no additional cost to UMA.

C. Provide temporary partitions and ceiling as required to separate work areas from occupied areas, to prevent penetration of dust and moisture into occupied areas, to prevent damage to existing areas and equipment. Construction shall be framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces; (STC rating 35 in accordance with ASTM E900. Flame Spread Rating of 25 in accordance with ASTM E84. Paint surfaces exposed to view in occupied areas.)

1.14 CLEANING DURING CONSTRUCTION

A. Unless otherwise specified under the various Sections of the Specifications, the General Contractor shall perform clean-up operations during construction as herein specified.

1. Refer to Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for additional requirements.

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site in a legal manner. The General Contractor shall bear all costs, including fees resulting from such disposal.

C. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finish operations.

D. Maintain project in accordance with all local, Commonwealth of Massachusetts, and Federal Regulatory Requirements.

E. Store volatile wastes in covered metal containers, and remove from premises.

F. Prevent accumulation of wastes which create hazardous conditions.

G. Provide adequate ventilation during use of volatile or noxious substances.

H. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.
4. Identify potential sources of cleaning water runoff and propose abatement procedures.

I. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

J. Use only those cleaning materials and methods recommended by manufacturer of surface materials to be cleaned.

K. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.

L. Provide on-site containers for collection of waste materials, debris, and rubbish.

M. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal dump site (DEP approved).

N. Handle material in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

O. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.

1.15 FIELD OFFICES

A. UMA will make an area within Mullin Center available to the General Contractor for their field office field offices.

B. The General Contractor shall, on a daily basis, maintain all of the offices clean, orderly, heated and air conditioned.

1.16 TELEPHONE SERVICE

A. The General Contractor shall provide and maintain cell phones and cell phone service so that the UMA Project Manager can contract the General Contractor.

1.17 SANITARY FACILITIES

A. The General Contractor may use designated toilet facilities for its staff within the building.

1.18 CONSTRUCTION BARRIERS

A. Proper construction barriers shall be provided around the contract work areas as defined by the Contract Drawings or as directed by the Resident Engineer.
B. Construction barriers shall consist of traffic cones, ribbons, tapes, secure fencing, trench covers, wood barriers, warning signs, directional signs, and other traffic materials to keep traffic and people from area of construction and maintain ongoing operations.

C. Barriers shall be erected at such approved locations as are necessary, sufficiently cross-braced and supported adequately from floors and ceilings as required.

1.19 PARKING

A. Parking: Parking spaces on Campus are very limited and the University will not provide designated parking lot spaces near the construction site for the Contractor’s use. The Contractor shall contact Parking Services (545-0065) to determine the location of the nearest available parking spaces. The Contractor will be required to pay all fees for parking. The Contractor shall state his/her parking and staging area requirements during the Pre-construction Meeting. The area(s) for materials storage will then be agreed to between the Contractor and the UMA Project Manager. The limits of material storage will be delineated by the Contractor with construction fencing and enforced throughout the Contract.

1.20 DEBRIS CONTROL AND REMOVAL

A. Debris shall not be permitted to accumulate or migrate and the work shall at all times be kept satisfactorily clean. Facility trash receptors shall not be used for the disposal of debris. Dumpster shall be provided by the General Contractor for removal of debris for all Subcontractors.

B. Remove debris from the work site on a daily basis and dispose of same at any (private or public) DEP approved dump that the General Contractor may choose providing that the General Contractor shall make all arrangements and obtain all approvals and permits necessary from the owner or officials in charge of such dumps. Proposed dump site shall be submitted to be approved by UMA prior to start of demolition. During disposal process, copies of daily receipts from dumpsite shall be submitted on a regular basis.

1.21 SAFETY PROTECTION

A. At no time shall the work be left unattended without proper safety protection and shall not be left unprotected to the weather and accessible to the public. It is the responsibility of the General Contractor to maintain proper safety protection for the public while work is in progress or unattended.

1.22 VEHICLE AND EQUIPMENT PROTECTION

A. All construction activities shall be performed in such a manner so as not to dust, stain or damage any building elements, equipment, vehicles, etc. within general vicinity of the construction work area. Any damage to these items shall be cleaned and repaired at the expense of the General Contractor.
1. All construction vehicles and equipment on site shall be effectively disabled and secured when not in use.

1.23 SHORING

A. The Subcontractors shall provide all temporary shoring and bracing as required for the proposed work. Comply with all applicable codes and standards.

1.24 CONSTRUCTION FENCE

A. A construction fence shall be provided along the entire perimeter of the contract limit lines, and shall be kept in good repair at all times, and shall be arranged to maintain ongoing operation’s access and egress.

B. Construction fences shall be six feet high and of chain link, or approved equal, erected in a substantial manner, straight, plumb and true as approved by the Designer.

C. Gates shall be built into fence at such approved locations as are necessary, well cross-braced and hung on heavy strap hinges with proper post and hook for double gates. Provide heavy hasps and padlocks for each gate. Provide a set of three keys for each lock to UMA Project Manager and Resident Engineer to facilitate emergency access.

D. Fencing shall be removed by the General Contractor at no cost to the Commonwealth at such time before final completion as the Designer directs. Restore site to acceptable condition after removing fence.

1.25 PROJECT IDENTIFICATION

A. Request sketch of sign language and graphics from the UMA Project Manager in sufficient time that sign can be fabricated and erected at start of construction.

B. The General Contractor shall provide one 6 foot high by 8 foot wide project sign as indicated and specified following, conforming to UMA requirements. Sign shall be fabricated from 1-inch thick MDO exterior grade plywood laminated with waterproof glue. Edges of sign shall be banded with 1 inch by 1/2 inch pressure treated pine banding. Contact the UMA Project Manager for wording for this specific project.

C. Sign shall be supported by two 4 by 4 inch post supports set in 12 inch diameter concrete footings to a depth of four feet, such that sign bottom is raised 4 feet above grade. Nails, bolts, and connecting hardware shall be galvanized. Provide alternative method of support if required by site conditions and approved by the UMA Project Manager.

D. Sign shall be lettered by a professional sign painter, in accordance with the general layouts attached. Lettering shall be gloss vinyl, size, and color as indicated as attached. Surfaces and edges of sign shall receive two coats of exterior primer and two coats of exterior gloss enamel.

E. Submit a shop drawing indicated sign construction and lettering for approval by the UMA Project Manager. The official project title and an electronic file of the attached sketches in
Autocad drawing format can be provided to the General Contractor by the UMA Project Manager upon request.

F. Locate and install the sign at location directed by the UMA Project Manager. At the completion of the Project, remove the sign and supports completely and restore surface to original condition.

1.26 DELIVERY OF MATERIALS

A. All Materials shall be delivered to the Contractor’s or Sub-Contractor’s warehouse or may be delivered to the site if the Contractor’s representative is present to receive them.

B. No materials will be received by University personnel, either on site or at the University’s shipping and receiving dock.

1.27 SHUT DOWN NOTICE

A. The Contractor shall notify the U.M.A. Project Manager or Resident Engineer, at least fourteen (14) working days in advance, of the need for University personnel to shut down or modify any utilities or building systems. If, due to University emergencies or staffing shortages, the Physical Plant personnel are unable to provide the required shut down or modifications, the contractor shall reschedule their work at no cost to the University.

1.28 CONSTRUCTION CORES

A. Contractor shall review with the U.M.A. Project Manager which doors will require construction cores.

B. For existing and new doors requiring installation of construction cores, the Physical Plant lock shop shall remove the existing core and install University keyed construction cores. The Contractor will be required to sign out keys for the construction cores at the lock shop. At completion of the construction work the Physical Plant lock shop will remove the construction core and reinstall the appropriate final core. The Contractor is required to return all construction core keys to the lock shop at completion of the project.

1.29 COVERED WALKWAYS

A. Install temporary overhead protection at building entrances, for an appropriate distance from the building, when performing construction work above the entrance on the roof or building façade.

B. Comply with standards and code requirements for erecting structurally adequate overhead protection. Erect overhead protection using appropriate scaffold and wood plank decking to provide safe passage.
1.30 EXCAVATIONS AND FIELD SURVEY REQUIREMENTS

A. Prior to the backfill of any underground utility, the Contractor shall notify the Resident Engineer, 24 hours prior to any such activity. The Contractor shall provide all survey services required for the work, including establishing and reestablishing construction control, resetting of stakes and monuments and performing surveys needed for restoration of public and private improvements and monumentation that have been damaged, destroyed or relocated by the Contractor.

B. The University reserves the right to request Survey Field data and as-built field data on an as needed basis during the construction contract and at no additional cost to the University. supports completely and restore surface to original condition.

C. All site and utility work, including as-built documentation, shall incorporate the use of NAD83 and NAVD88 datum’s Massachusetts’s coordinate system mainland zone. The Contractor shall deliver a comma delineated as-built file or files designating each individual utility being as-built. Each point as-built shall have five fields, point number, northing, easting, elevation and descriptor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 016000
PRODUCT REQUIREMENTS

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 REQUIREMENTS INCLUDED

A. Products include material, equipment, and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.

D. Do not use materials and equipment removed from existing structures, except as specifically required, or allowed, by the Contract Documents.

E. In the case of an inconsistency between Drawings and the Project Manual, or within either document which is not clarified by addendum, the product of greater quality or greater quantity of work shall be provided in accordance with the Designer’s interpretation.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.4 MANUFACTURERS' INSTRUCTIONS

A. When work is specified to comply with manufacturers' instructions, submit copies as specified in Section 013300 - SUBMITTAL REQUIREMENTS, distribute copies to persons involved, and maintain one set in field office.

B. Perform work in accordance with details of instructions and specified requirements.
1.5 TRANSPORTATION AND HANDLING

A. Refer to the Contract and General Conditions and Specifications Sections for requirements pertaining to transportation and handling of materials and equipment.

B. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturers' labeled and unopened containers or packaging, dry.

C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct, and products are undamaged.

1.6 STORAGE AND PROTECTION

A. Refer to the Contract and General Conditions and Specifications Sections for requirements pertaining to storage and protection of materials and equipment.

B. Store products in accordance with manufacturers' instruction, with seals and labels intact and legible. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturers' instructions.

C. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

D. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

E. Arrange storage to provide access for inspection. Periodically inspect to assure that products are undamaged, and are maintained under required conditions.

F. Protect masonry and stone products from damage and staining.

G. Protect finished materials, including window frames and doors, with protection acceptable to the UMA Project Manager.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 017418

DEMOLITION WASTE MANAGEMENT AND DISPOSAL

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 SUMMARY

A. This Section includes administrative and procedural requirements for recycling and disposing of demolition waste.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 013543 - ENVIRONMENTAL PROTECTION PROCEDURES:
   a. Environmental-protection measures during construction.

2. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
   a. Additional requirements for addressing existing materials in renovation and/or remodeling projects; not applicable to new construction.

1.3 DEFINITIONS

A. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waste or debris.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.
1.4 PERFORMANCE REQUIREMENTS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 75 percent by weight of total waste generated by the Work.

B. Salvage/Recycle Requirements: Salvage and recycle as much non-hazardous demolition and construction waste as possible including the following materials:

1. Asphaltic concrete paving.
2. Concrete and concrete reinforcing steel.
3. Brick and concrete masonry units.
4. Coated brick, concrete, and concrete masonry units. Coatings shall include, but not be limited to: paint, stucco applications, plaster, etc..
5. Wood studs, wood joists, plywood, oriented strand board, paneling and trim.
6. Casework and cabinetry.
7. Structural steel, miscellaneous steel and rough hardware.
8. Roofing.
9. Insulation.
10. Doors, door frames and door hardware.
11. Windows, glass, plastic and glazing.
12. Metal studs.
15. Carpet and carpet pad.
16. Demountable partitions.
17. Equipment.
18. Plumbing fixtures, piping, supports, hangers, valves, and sprinklers.
19. Mechanical equipment and refrigerants.
20. Electrical conduit, copper wiring, lighting fixtures, lamps, and ballasts.
21. Electrical devices, switchgear, panelboards and transformers.

C. In the event the General Contractor encounters previously unidentified material that is reasonably believed to be hazardous, asbestos containing, coated with lead-based paint, or oily debris, the General Contractor shall immediately stop work in the affected area and report the condition to the Designer and UMA. At no time shall such material be handled or disposed of by the General Contractor. The General Contractor agrees to cooperate with UMA and any consultants engaged by UMA to perform services with respect to the analysis, detection, removal, containment, treatment, and disposal of such regulated materials.

1.5 SUBMITTALS

A. Waste Management Plan (WMP): Submit three copies of plan within 30 days of date established for the Notice to Proceed, in a format acceptable to the UMA Project Manager.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before submitting a request for Substantial Completion, submit three copies of calculated final rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Facility Permitting Information: For disposal and incinerator facilities provide a copy of the facility’s current solid waste management facility permit in accordance with 310 CMR 19.000.

E. Facility Permitting Information: For off-site ABC rubble crushing and/or recycling facilities, provide a statement from the facility that references its specific exemption from the solid waste regulations (per 310 CMR 16.05 (3) (e)) or provide a copy of the facility’s current solid waste management facility permit in accordance with 310 CMR 19.000.

F. Record Keeping for Recycling and Landfill and/or Incinerator Disposal: Documentation to be submitted by the Contractor shall include the following as a condition of each payment:

1. 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.
2. 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.

G. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

H. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

I. Qualification Data: The Refrigerant Recovery Technician shall be certified by EPA-approved certification program and shall provide a copy of current certification to the Designer prior to starting work.

J. Statement of Refrigerant Recovery: The Refrigerant Recovery Technician responsible for recovering refrigerant shall prepare and sign a document stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations and using equipment that has a current EPA Registration. The document shall include the name and address of technician, date refrigerant was recovered, amount of refrigerant recovered and shipped, and date of receipt of shipment by the reclaimer.

1.6 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: The Refrigerant Recovery Technician will use recycling/recovery equipment that has a current EPA Registration.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction, including but not limited to, Massachusetts solid waste regulations contained in 310 CMR 16.00 and 310 CMR 19.000.
1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, and waste reduction, handling, transportation and recycling/disposal procedures. Include separate sections in plan for recycling and disposal of demolition waste. Indicate quantities by weight throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and site-clearing waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Program: List each type of waste and whether it will be recycled or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

   1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
   3. Donated Materials: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.
   4. Sold Materials: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.

D. Handling and Transportation Procedures: Include methods that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location(s) on Project site where materials separation will be located.

E. Waste Management Coordinator: Identify General Contractor employee who will be the Waste Management Coordinator for the project. The Waste Management Coordinator will be responsible for implementing, monitoring, and reporting status of waste management work plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement Waste Management Plan as approved by the Designer. Provide containers, storage, signage, transportation, and other items as required to implement WMP for the entire duration of the Contract.

B. The General Contractor shall conduct a Waste Management Meeting at the Site. The General Contractor shall review methods and procedures related to waste management including, but not limited to, the following:
1. Distribute approved WMP to everyone concerned within three days of approved submittal return.
2. Clearly identify the Waste Management Coordinator and explain the Coordinator's responsibilities.
3. Review WMP with each subcontractor when they first begin work on-site. Review plan procedures and locations established for recycling and disposal.
4. Review and finalize procedures for material separation and verify availability of containers and bins needed to maintain production.
5. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
6. Provide recycling educational literature for all workers, Subcontractors, and suppliers engaged in on-site activities.
7. Provide appropriate recycling signage for containers and workspaces.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, sold, and disposed.
2. Comply with project requirements for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Sale and Donation: Sale activities are not permitted on Project site. Labor for loading donated items acceptable to local trade practices; union labor if applicable.

3.3 RECYCLING DEMOLITION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: Available recycling receivers and processors include, but are not limited to, those listed in the Massachusetts Recycling Directory, available from the Massachusetts State Bookstore (617-727-2834) located in the Massachusetts State House, for recycling operations within the Commonwealth of Massachusetts.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical. For waste which cannot be separated at Project site, co-mingle only with waste which is to be separated later at a recycling facility. Contamination of recycling containers with trash or other contaminants will be addressed by the General Contractor and who will be solely responsible for payment of all fines and penalties.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off UMA’s property and transport to recycling receiver or processor.

D. On-site crushing of non-coated asphalt pavement, brick, and concrete (ABC) rubble as described in 310 CMR 16.05, is allowed, provided performed in accordance with 310 CMR 16.05. All coated ABC waste must be transported off-site to an asphalt batching plant or to an ABC crushing or recycling operation that is either conditionally exempt from 310 CMR 16.00 or has been sited and permitted in accordance with 310 CMR 16.00 and 310 CMR 19.000, respectively.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Deposit all debris in designated container to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for fill or sub-base.

C. Masonry: Deposit all masonry debris in designated container to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for general fill or satisfactory soil for fill or sub-base. Clean and stack undamaged whole masonry units on wood pallets for reuse.

D. Wood Materials: Sort and stack salvageable members according to size, type, and length. Separate lumber waste and deposit into appropriate container. Separate engineered wood products, panel products, and treated wood materials into designated containers.

E. Metals: Separate metals by material type if practical. Stack salvageable structural steel members according to size, type of member, and length.

F. Asphalt Shingle Roofing: Organic and glass-fiber asphalt shingles and felts shall be disposed of at a facility permitted by Massachusetts Department of Environmental Protection (DEP) to process post-consumer (used) asphalt shingles. Recycle nails, staples acceptable, flashing trim and accessories as metals.

1. Asbestos containing shingles shall be pre-abated and properly disposed of by a Massachusetts licensed asbestos abatement General Contractor, in accordance with all applicable regulations. Asbestos abatement work, including disposal of asbestos contain materials, is not included in the scope of the Work and will be performed by others.

G. Glass: Deposit glass debris into designated containers to be transported to approved glass-recycling facility.

H. Plastics: Deposit plastic containers and debris into designated containers to be transported to approved plastic recycling facility.

I. Gypsum Board: Deposit scraps of gypsum board into designated container protected from weather and transport to appropriate gypsum-recycling facility to be processed into soil amendment.
J. Acoustical Ceiling Panels and Tile: Deposit pulp able mineral fiber panels into designated container protected from weather and prepare for transport, as directed by manufacturer, to appropriate recycling facility to be processed into new acoustic ceiling panels. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

K. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

L. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

M. Plumbing Fixtures: Separate by type and size fixtures suitable for reuse. Deposit all other fixtures into designated containers by material type to be transported to approved recycling facility.

N. Piping: Separate piping materials by material composition. Deposit in designated containers. Separate supports, hangers, valves, sprinklers, and other components by material type and deposit in designated containers for transport to approved recycling facility.

O. Lighting Fixtures: Separate lamps by type and protect from breakage.

P. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

Q. Conduit: Deposit conduit and fittings into designated container.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. For solid waste disposal facilities located in the Commonwealth of Massachusetts, dispose of materials only in facilities which currently comply with applicable state regulations, including requirements of 310 CMR 16.00 {Site Assignment for Solid Waste Facilities} and 310 CMR 19.000 {Solid Waste Management}, and local bylaws.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off the Owner’s property and legally dispose of them.

END OF SECTION
SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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 SUMMARY
A. This Section includes administrative and procedural requirements for recycling and disposing of construction waste.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 013543 - ENVIRONMENTAL PROTECTION PROCEDURES:
   a. Environmental-protection measures during construction.

2. Section 017418 - DEMOLITION WASTE MANAGEMENT AND DISPOSAL
   a. Additional requirements for addressing existing materials in renovation and/or remodeling projects; not applicable to new construction.

1.3 DEFINITIONS
A. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waste or debris.

B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, and/or installation of new materials as part of remodeling, renovation, or repair operations. Construction waste includes packaging.

   1. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations prior to renovations or remodeling.

C. Disposal: Removal off-site of construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Develop a Waste Management Plan that states as its objective to attain at project completion a recycling rate of 75 percent or more by weight of the total waste generated by the Work.

B. Recycling Requirements:

1. Maximize recycling of non-hazardous construction waste including the following materials:
   a. Site-clearing waste.
   b. Masonry and CMU.
   c. Lumber, wood sheet materials, and wood trim.
   d. Metals.
   e. Roofing.
   f. Insulation.
   g. Glass.
   h. Plastics.
   i. Gypsum board, refer to paragraph below.
   j. Acoustical ceiling panels.
   k. Carpet and pad.
   l. Piping.
   m. Wire and cable.
   n. Electrical conduit.
   o. Packaging: 100 percent of the following uncontaminated packaging materials: Paper, cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, plastic pails.

2. Clean Gypsum Board Waste: For new construction and renovation projects involving 20,000 square feet or greater, divert clean (virgin material) gypsum board waste from disposal to recycling and/or reuse outlets.
   a. For new construction and renovation projects involving less than 20,000 square feet, contractors are encouraged to divert clean gypsum board waste from disposal to recycling and/or reuse outlets.
   b. Clean (virgin material) gypsum board is defined as material without any existing attached material, including but not limited to adhesives, mastics, and paints.

1.5 SUBMITTALS

A. Waste Management Plan (WMP): Submit 3 copies of Plan within 30 days of date established for the Notice to Proceed, in a format acceptable to the UMA Project Manager.

B. Waste Management Progress Reports: Concurrent with each Application for Payment, submit three copies of report. The following information shall be included:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste recycled, both estimated and actual in tons.
5. Total quantity, of waste recovered (recycled) as a percentage of total waste.

C. Waste Management Calculations: Before submitting a request for Substantial Completion, submit three copies of calculated final rates for recycling and disposal as a percentage of total waste generated by the Work.

D. Facility Permitting Information: For landfill and/or incinerator facilities, provide a copy of the facility’s current solid waste management facility permit in accordance with 310 CMR 19.000.

E. Record Keeping for Recycling and Landfill and/or Incinerator Disposal: Documentation to be submitted by the General Contractor shall include the following:

1. 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.
2. 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.

F. Facility Permitting Information: For ABC rubble crushing and/or recycling facilities, provide a statement from the facility that references its specific exemption from the solid waste regulations (per 310 CMR 16.05 (3) (e)) or provide a copy of the facility’s current solid waste management facility permit in accordance with 310 CMR 19.000.

G. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

H. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction, including but not limited to, Massachusetts solid waste regulations contained in 310 CMR 16.00 and 310 CMR 19.000.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, and waste reduction, handling, transportation, and recycling/disposal procedures. Include separate sections in plan for recycling and disposal of construction waste. Indicate quantities by weight throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Program: List each type of waste and whether it will be recycled or disposed in a landfill or incinerator. Include points of waste generation, total quantity by weight of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. Donated Materials: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.
4. Sold Materials: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.

D. Handling and Transportation Procedures: Include methods that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location(s) on Project site where separated materials will be stockpiled.

E. Waste Management Coordinator: Identify General Contractor employee who will be the Waste Management Coordinator for the project. The Waste Management Coordinator will be responsible for implementing, monitoring, and reporting status of waste management activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement Waste Management Plan as approved by the Designer. Provide containers, storage, signage, transportation, and other items as required to implement WMP for the entire duration of the Contract.

B. The General Contractor shall conduct a Waste Management Meeting at the Site. The General Contractor shall review methods and procedures related to waste management including, but not limited to, the following:

1. Distribute approved WMP to everyone concerned within three days of approved submittal return.
2. Clearly identify the Waste Management Coordinator and explain the Coordinator's responsibilities.
3. Review WMP with each subcontractor when they first begin work on-site. Review plan procedures and locations established for recycling and disposal.
4. Review and finalize procedures for material separation and verify availability of containers and bins needed to maintain production.
5. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
6. Provide recycling educational literature for all workers, Subcontractors and suppliers engaged in on-site activities.
7. Provide appropriate recycling signage for containers and workspaces.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walkways, and other adjacent occupied facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be recycled, reused, donated, sold, and disposed.
2. Comply with project requirements for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical. For waste, which cannot be separated at Project site, co-mingle only with waste, which is to be separated later at a recycling facility. The General Contractor will address contamination of recycling containers with trash or other contaminants and who will be solely responsible for payment of all fines and penalties.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off User Agency's property and transport to recycling receiver or processor.

B. On-site crushing of asphalt pavement, brick, and concrete (ABC) rubble as described in 310 CMR 16.05, is not allowed. All ABC waste must be transported off-site to an asphalt batching plant or to an ABC crushing or recycling operation facility that is either conditionally exempt from 310 CMR 16.00 or has been sited and permitted in accordance with 310 CMR 16.00 and 310 CMR 19.000, respectively.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
3. Pallets: To the extent feasible, require shippers using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

C. Concrete: Deposit all debris in designated containers to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for fill or sub-base.
D. Masonry: Deposit all masonry debris in designated containers to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for general fill or satisfactory soil for fill or sub-base. Clean and stack undamaged whole masonry units on wood pallets.

E. Wood Materials:
   1. Clean Cut-Offs of Lumber: Deposit into designated clean wood container to be transported to designated recycling facility for use as mulch or bio-fuel.
   2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

F. Metals: Separate metals by material type if practical. Stack salvageable structural steel members according to size, type of member, and length.

G. Asphalt Shingle Roofing: Deposit asphalt shingles in designated containers for off-site reuse. Nails, staples acceptable, flashing trim and accessories shall be recycled as metals.

H. Glass: Deposit glass debris into designated containers to be transported to approved glass-recycling facility.

I. Plastics: Deposit plastic containers and debris into designated containers to be transported to approved plastic recycling facility.

J. Clean Gypsum Board: Deposit scraps of clean gypsum board into designated container protected from weather and prepare for transport, as directed by manufacturer, to appropriate recycling facility to be processed into new acoustic ceiling panels. Separate suspension system, trim, and other metals from panels and sort with other metals.

K. Acoustic Ceiling Panels: Deposit pulpable mineral fiber panels into designated container protected from weather and prepare for transport, as directed by manufacturer, to appropriate recycling facility to be processed into new acoustic ceiling panels. Separate suspension system, trim, and other metals from panels and sort with other metals.

L. Carpet: Deposit carpet into designated container protected from weather and prepare for transport, as directed by manufacturer, to appropriate recycling facility to be processed into new products.

M. General: Recycle paper and beverage containers used by on-site workers.

3.4 DISPOSAL OF WASTE

A. Except for items or materials to be recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. For solid waste disposal facilities located in the Commonwealth of Massachusetts, dispose of materials only in facilities which currently comply with applicable state...
regulations, including requirements of 310 CMR 16.00 {Site Assignment for Solid Waste Facilities} and 310 CMR 19.000 {Solid Waste Management}, and local bylaws.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION
SECTION 017700

CONTRACT CLOSEOUT

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 FINAL CLEANING

A. Unless otherwise specified under the various Sections of the Specifications, the General Contractor shall perform final cleaning operations as herein specified prior to final inspection.

B. Maintain project site free from accumulations of waste, debris, and rubbish, caused by operations. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

C. Cleaning shall include all surfaces, interior and exterior in which the General Contractor has had access whether existing or new.

D. Refer to Sections of the Specifications for cleaning of specific products or work.

E. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

F. Use only those cleaning materials and methods that are recommended by the manufacturer of surface material to be cleaned.

G. Employ experienced workmen, or professional cleaners, for final cleaning operations.

H. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

I. Wash and polish mirrors.

J. All new and existing glass and plastic surfaces throughout the building shall be thoroughly cleaned and washed by qualified window cleaners at the expense of the General Contractor just prior to acceptance of the Work.

K. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces as acceptable to the UMA Project Manager.

L. Polish glossy surfaces to a clear shine and provide wax where necessary.

M. Ventilating Systems: Clean permanent filters and replace disposable filters if units were operated during construction. Units should not be operated without filters at all. Throw away
filters should be used when operating units prior to Substantial Completion. Submit report of ventilation system cleanliness including ductwork to the UMA Project Manager.

N. Broom clean exterior paved surfaces and rake clean other surfaces of the grounds.

O. Leave all architectural metals, hardware, and fixtures in undamaged polished conditions.

P. Leave pipe and duct spaces, plenums, furred spaces and the like clean of debris and decayable materials.

Q. At the end of the project, General Contractor and each Subcontractor shall remove all his tools, equipment, machinery, and surplus materials from the job site. The General Contractor shall remove all waste materials and rubbish from the project at this time. All temporary structures shall be removed and the project shall be left clean.

R. Subsequent to installation of User Agency furniture, telephones, and equipment, and prior to issue of Certificate of Use and Occupancy, provide additional cleaning to remove any soil resulting from installations of such furniture and equipment. Such additional cleaning may include, but not be limited to dusting of horizontal surfaces, vacuuming, and washing of hard or resilient floor surfaces and re-waxing where required.

1.3 LANDSCAPE REPAIRS

A. All lawn areas used for contractor parking and material storage shall have the topsoil removed, the subsoil shall be loosened to 12” below finished grade, the topsoil shall be replaced and amended with a complete, slow release fertilizer, proof rolled and seeded with a restoration seem mix consisting of:

<table>
<thead>
<tr>
<th>Pure Seed</th>
<th>Germ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.72% KENTUCKY BLUE GRASS 85/80</td>
<td>95%</td>
</tr>
<tr>
<td>24.68% CREEPING RED FESCUE</td>
<td>85%</td>
</tr>
<tr>
<td>19.82% OMEGA III PERENNIAL RYE GRASS</td>
<td>95%</td>
</tr>
<tr>
<td>19.78% SATURN PERENNIAL RYEGRASS</td>
<td>95%</td>
</tr>
</tbody>
</table>

B. All lawn areas damaged by pedestrian or vehicular traffic due to the contractor’s operations shall be aerated. Aeration shall consist of 9”-10” deep infractions at areas free of tree roots and at areas within tree drip lines shall be aerated 1”-3” with a tow behind 3- point hitch aerator. If in the opinion of the Campus Landscape Architect, the lawn areas require over-seeding or restoration, the following seed mixture shall be used at a rate to be determined:
# AS-BUILT DRAWINGS

A. As-built Drawings shall consist of all the Contract Drawings. As-built Drawings shall be kept up-to-date. Information from on-going Work shall be recorded on As-built Drawings within 48 hours of Work being performed.

B. The General Contractor and each Subcontractor shall be required to maintain one set of As-built Drawings, as the work relates to their Sections of the Specifications, at the site.

C. The As-built Drawings shall be stored and maintained in the General Contractor's field office apart from other documents used for construction. The As-built Drawings shall be maintained in a clean, dry, and legible condition and shall not be used for construction purposes.

D. As-built Drawings, as submitted by the General Contractor shall be verified in the field by the Designer or his Consultants. Verification by the Designer shall occur during the construction process and prior to the related work being completed and covered up.

E. The As-built Drawings shall be available at all time for inspection by the UMA Project Manager or Designer. All deficiencies noted shall be promptly corrected.

F. The following information shall be indicated on the As-Built Drawings:

   1. Record all changes, including change orders, in the location, size, number and type both horizontally and vertically of all elements of the project which deviate from those indicated on all the Contract Drawings.
   2. The tolerance for the actual location of utilities and appurtenances within the building to be marked on the As-built Drawings shall be plus or minus two (2) inches.
   3. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) ft. intervals and at all changes of direction.
   4. The location of all internal utilities and appurtenances, concealed by finish materials, including but not limited to valves, coils, dampers, vents, cleanouts, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps and maintenance devices. The location of these internal utilities, appurtenances, and devices shall be shown by offsets to the column grid lines on the Drawings.
   5. Each of the utilities and appurtenances shall be referenced by showing a tag number, area served and function on the As-built Drawings.

G. At the end of each month and before payment for materials installed, the General Contractor, each Subcontractor, and agents of the Commonwealth shall review As-built Drawings for purpose of payment.
1. If the changes in location of all installed elements are not shown on the As-Built Drawings and verified in the field, then the material shall not be considered as installed and payment will be withheld.

H. Prior to the installation of all finish materials, a review of the As-built Drawings shall be made to confirm that all changes have been recorded. All costs to investigate such conditions shall be borne by the applicable party as determined by the Designer.

I. At the completion of the contract, each Subcontractor shall submit to the General Contractor a complete set of his respective As-built Drawings indicating all changes. After checking the above drawings, the General Contractor shall certify in writing on the title sheet of the drawings that they are complete and correct and shall submit the As-built Drawings to the Designer.

1. As-Built Drawings shall be submitted electronically to the Designer, in a format which can be added to the complete plans as constructed.

J. The Designer shall review the drawings and shall verify by letter to the UMA Project Manager that the work is accurate. The Designer shall incorporate all changes on the original drawings; thus creating Record Drawings. The Designer shall submit to the UMA Project Manager, electronic files in Autocad 2000 (or later version) format with two (2) sets of prints to be used for the final inspection of the project. Inaccuracies in As-built Drawings, as determined by the Designer and the UMA Project Manager, may be grounds for postponement of the final inspection or delay the processing of final payment until such inaccuracies are corrected by the General Contractor.

1.5 OPERATING AND MAINTENANCE REQUIREMENTS

A. At least two weeks prior to the time of turning over this contract to the Operating Agency for Use and Occupancy, or Final Acceptance, the General Contractor shall secure and deliver to the Operating Agency via the Designer, three (3) complete, indexed files and three (3) CD or DVD copies, containing approved operating and maintenance manuals, shop drawings, record of paint colors, floor and ceiling materials and other data as follows.

1. Operating manuals and operating instructions for each model and type of equipment in each of the various systems. Include operating instructions for systems integrating several pieces of equipment.
2. Catalog data sheets for each item of mechanical or electrical or equipment actually installed including performance curves, rating data and parts lists.
3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical or electrical equipment controls and fixtures with all details clearly indicated, including size of lamps and other maintenance supplies.
4. Operating procedures, including startup, shutdown, seasonal and weekend operations.
5. Description of controls and sequence of operations.
6. Maintenance Data:
   a. Manufacturer's information, including list of spare parts.
   b. Name, address, and telephone number of Installer or supplier.
   c. Maintenance procedures.
   d. Maintenance and service schedules for preventive and routine maintenance.
   e. Maintenance record forms.
   f. Sources of spare parts and maintenance materials.
g. Copies of maintenance service agreements.

h. Copies of warranties and bonds.

i. Name, address and telephone numbers of repair and service companies for each of the systems installed.

7. Names, addresses and telephone numbers of all Subcontractors and suppliers, together with repair and service companies for each of the major systems installed under this contract.

8. Provide a steel cabinet for storage of manuals and operating instructions.

B. Non-Availability of operating and maintenance manuals or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the UMA Project Manager until such time as the discrepancy has been corrected.

1.6 DEMONSTRATION AND TRAINING

A. Instruction: Instruct University’s personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

3. Schedule training with Physical Plant personnel with at least fourteen (14) days' advance notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.

2. Review of documentation.

3. Operations.

4. Adjustments.

5. Troubleshooting.


7. Repair.

1.7 CLOSEOUT REQUIREMENTS AND SUBMITTALS

A. Procedural Requirements Prior to Use and Occupancy: Punch List:

1. During the finishing stages of the project, the General Contractor shall make frequent inspections with Subcontractors, the Designer, and the UMA Resident Engineer, so as to progressively check for and correct faulty work.

2. During the course of construction of the project, the General Contractor shall procure and maintain test records and certificates that will be required prior to issuance of the Department of Public Safety (DPS) Certificate of Occupancy and the Division of Capital Asset Management (UMA) Certificate of Agency Use and Occupancy.
3. When the General Contractor determines that he/she is Substantially Complete*, he/she shall prepare for submission to the Designer a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the General Contractor to complete all work in accordance with contract Documents. The General Contractor’s list shall be accompanied with certificates that will be required as prerequisites for applying for a DPS inspection
   a. *NOTE: Substantially Complete means that less than one percent (1%) of all contract work, including change orders, remains to be done, and that none of the remaining work will affect health, safety, or function.

4. Upon receipt of the General Contractor’s list of items to be completed or corrected, the Designer will promptly make a thorough inspection, together with representatives of UMA and the Operating Agency, and prepare a “punch list”, setting forth in accurate detail any items on the General Contractor’s list and additional items that are not acceptable. Concurrently, the General Contractor will arrange for a DPS inspection, Amherst Fire Department, Town of Amherst Electrical and other required inspections through UMA EH &S or as directed by UMA Project Manager.

5. When the punch list has been prepared, and any DPS Inspector comments* have been included, the Designer will arrange a meeting with the General Contractor and Subcontractors, and the UMA Project Manager, to identify and explain all punch list items and answer questions on the Work that must be done before Final Acceptance.
   a. If a DPS inspector (including, but not limited to AABA, boiler, elevator or any other authorized inspector) requires modifications and/or additions that were not included in the construction documents, the Designer should review the applicable code(s) and provide written interpretation to the UMA Project Manager together with his/her recommendations.

6. The General Contractor shall immediately correct all punch list items that affect health, safety or function (as determined by the Designer, completion of which is required before issuance of a UMA Certificate of Agency Use and Occupancy).

7. Upon receipt of the UMA Certificate of Agency Use and Occupancy, and its adjunct monetized punch list, the General Contractor shall cause the completion of all of the other punch list items within the timeframe required by said certificate, but not more than 45 calendar days if the timeframe is not indicated on the said certificate.

8. There is a history of specific items that are essential to the Use and Occupancy, but are frequently overlooked. Some things to watch for are:
   a. Provide properly colored and positioned exit signs.
   b. Properly located emergency lighting fixtures.
   c. Complete or, by agreement, schedule personnel training.
   d. Final cleaning.
   e. Ventilating systems:
      1) Clean permanent filters and replace disposable filters if units were operated during construction.
      2) Clean ducts, blowers, and coils if units were operated without filters during construction.
      3) Leave pipe and duct spaces, plenums, furred spaces and the like clean of debris and materials subject to decay.
   f. Provide a properly working lock for the medical environmental closets (if applicable).
   g. Assure that exterior and interior fire rated and egress doors are operating properly and have the proper hardware.
h. Assure that fire-rating labels are on doors and frames that are supposed to have them.

i. Assure that smoke barriers are properly installed and located.

j. Assure that the spare set of each type of sprinkler head and a head removal tool have been provided.

k. Assure that floors drain properly.

l. Assure that proper hot water temperatures are provided. Unless otherwise specified or required by a User Agency, the temperature set on building master controllers of hot water shall apply:
   1) HW to toilet rooms and janitors closets shall be 140°F.
   2) HW to individual tubs or showers shall be controlled, in addition to the master controller above, with thermostatic valves set to furnish HW at a temperature not exceeding 110°F and equipped with anti-scald feature.
   3) HW rinse water to dishwashers shall be controlled at 180°F.

m. Assure that proper water pressure is provided for the sprinkler system.

n. Assure that low-consumption (LC) toilets have been installed (1.6 gpf or less).

o. Re-lamp if permanent lighting system was used during construction.

p. As-built marked-up drawings should be completed and transferred over to the Designer.

q. Make final changeover of permanent locks and cores. Advise UMA Project Manager of changeover in security provisions.

r. Perform landscape repairs.

B. Prerequisites for Department of Public Safety (DPS) Certificate of Inspection and/or Certificate of Occupancy: Prior to requesting a Department of Public Safety (DPS) inspection, the General Contractor shall provide (via transmittal to the UMA Resident Engineer) the following “closeout submittals:”

1. Project record documents and as-built marked-up drawings.
2. Recycling and Landfill records per Section 017419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL, para. 1.5, E.
3. Approved operating and maintenance (O & M) data.
4. Extended guarantees and warranties.
   a. General Contractor’s General Guarantee shall effectively include:
      1) A written guarantee, for one (1) year from date of Substantial Completion of the project, against defective workmanship, material, installation and equipment for all work of the project. Repair or replacement of defective workmanship, material, installation or equipment that develop within this period shall be accomplished promptly upon notification to the General Contractor, to the satisfaction of the Operating Agency, at no cost.
      2) Replace or repair material or equipment that requires excessive service during the guarantee period.
      3) Guarantee shall include 24-hour service of complete system(s) during guarantee period at no additional cost.
      4) Provide manufacturer’s engineering and technical staff at site promptly to analyze and rectify problems that develop during guarantee period. If problems cannot be rectified promptly, to the satisfaction of the User Agency, advise the Designer in writing; describe efforts to rectify situation and provide analysis of cause of problem.
   b. Manufacturer’s Guarantee or Warranty
1) In addition to guarantee requirements above, obtain manufacturers’ written installation, equipment, and material warranties for time periods indicated in the various Specification Sections of the Contract Documents. Such manufacturers’ warranties contained within the Specification Sections, together with any other warranties offered in manufacturers’ published data, are to be transferred to the User Agency.

c. Keys and keying schedule.
d. Spare parts and maintenance materials (“attic stock”),
e. Evidence of compliance with requirements of governing authorities including, without limitations, the following:
   1) Certificate of Inspection, in form of signed permits from the electrical, plumbing, gas, fire department, boiler, and any other required inspectors.
   2) Certification from the local fire department to the effect that all detection, alarm and suppression systems, and other equipment or systems under fire department jurisdiction are approved.
   3) When carpeting and/or draperies are provided, a flame, smoke and fuel-rating certificate provided by the supplying General Contractors.
   4) Elevator certification(s) from the elevator inspector obtained through the General Contractor’s Elevator Subcontractor.
   5) A letter from the Plumbing Subcontractor, that the potable water supply has been sanitized.
   6) Septic system certification obtained from the town by the General Contractor (when applicable).
   7) Pressurized vessel certifications from the boiler inspector obtained through the Mechanical Subcontractor.
   8) When air balancing is required, the air balancing report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable), and accepted by the design Registered Professional Engineer.
   9) When smoke control/fire emergency ventilation system is required, the test report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable), and accepted by the design Registered Professional Engineer.
  10) Evidence of test and approval for Department of Environmental Protection (DEP) and Department of Public Health (DPH), when applicable.

C. Prerequisites for Department of Public Safety (DPS) Certificate of Inspection and/or Certificate of Occupancy: Prior to requesting a Department of Public Safety (DPS) inspection, the Designer shall provide (via transmittal to the UMA Resident Engineer) the following “closeout submittals:”

  1. Certification, from the design Registered Professional Engineer, stating that the fire protection systems have been installed in accordance with the approved fire protection construction documents and meet the requirements of 780 CMR 903.1.
  2. Structural Engineer-of-Record (SER) final report as required by 780 CMR 1705.3.
  3. Certification, from the design Registered Professional Engineer, stating that the emergency lighting and power systems have been installed in accordance with the approved electrical construction documents.

D. Upon completion of the Work for which a permit has been issued, the DPS building official shall conduct a final inspection pursuant to 780 CMR 115.5.
E. Beneficial and Temporary Occupancy:

1. Beneficial (partial) Occupancy:
   a. UMA may allow beneficial (partial) occupancy of portions of a building in order to allow a User Agency to set up and test their own operational equipment in select building areas. It does not allow for use and/or occupancy of the general public when, in fact, the building cannot function for the use(s) it is intended to accommodate, nor when there are outstanding items that affect health, safety and/or function.
   b. It is UMA policy to disallow beneficial occupancy if the fire alarm and suppression systems are inoperative.
   c. Beneficial occupancy of building areas shall not constitute Substantial Completion, or Final Acceptance of work by UMA, and shall not institute the guarantee period for any work.
   d. A punch list will be developed for building areas to receive beneficial occupancy and the building areas will be photographed prior to such occupancy of said portion or portions of the work.

2. Temporary Occupancy:
   a. When, according to 780 CMR 120.3 – Temporary Occupancy upon the request of the holder of a permit, a Temporary Certificate of Occupancy (TCO) may be issued before the completion of the entire work covered by the permit, provided that such portion or portions shall be occupied safely prior to full completion of the building or structure without endangering life or public welfare. The Building Official may consult with all Subcontractor Inspectors for issues pertaining to life safety and shall consult with the Fire Official pertaining to issues of adequacy of fire protection systems prior to the issuance of a Temporary Certificate.
   b. The Building Official may issue a Temporary Certificate of Occupancy (TCO) that can allow public use and occupancy of said portion or portions of the work, subject to punch list(s) being established prior to such occupancy.
   c. Issuance of a Department of Public Safety (DPS) Temporary Certificate of Occupancy (TCO) does not relieve the General Contractor of the UMA requirements of the contract and does not constitute Substantial Completion of the project.
   d. Temporary Occupancy of building areas will institute the guarantee period for completed work of all Divisions except 21 through 28 of the Specifications for those building areas so used and occupied, exclusive of remaining work indicated on associated punch lists. Use of systems provided under Divisions 21 through 28 of the Contract Documents for temporary services and facilities shall not constitute Substantial Completion, or Final Acceptance of work by UMA, and shall not institute the guarantee period.

   (1) If it is determined that there are no items on the punch list that affect health, safety or function and it is agreed by the Building Official, the Designer and the UMA Project Manager that the entire building can be granted a Temporary Certificate of Occupancy (TCO), the work of all Divisions including 21 through 28 of the Specifications for the entire building so used and occupied, exclusive of remaining work indicated on associated punch lists, will institute the guarantee period for completed work of all Divisions including the systems provided under Divisions 21 through 28.

   (2) Whereas a User Agency cannot properly maintain building systems without operating and maintenance documentation, subcontractors for Divisions 21
through 28 will be responsible for maintaining their respective building systems at no additional cost to the contract until the project is substantially complete and Operating and Maintenance (O & M) manuals, reviewed and approved by the Designer, are provided to the UMA Project Manager.

(3) Issuance of a Temporary Certificate of Occupancy (TCO) may require remaining punch list work to be completed during irregular work hours. Such work will be performed at no additional cost to the contract.

e. The following UMA criteria, and any other criteria that may be imposed by the Building Official, are required for a DPS Temporary Certificate of Occupancy (TCO):

(1) Upon receipt of the General Contractor’s list of items to be completed or corrected, the Designer will promptly make a thorough inspection, together with representatives of UMA and the Operating Agency, and prepare a “punch list”, setting forth in accurate detail any items on the General Contractor’s list and additional items that are not acceptable. The Designer and UMA Project Manager will identify and tag (by asterisk) all items that, in their opinion, affect health, safety or function. The Building Official may include additional items that, in her/his opinion, affect items that endanger life or public welfare.

(2) When the punch list has been prepared, and all DPS Inspector comments* have been included, the General Contractor shall immediately correct all punch list items that affect health, safety or function (all asterisked items). This work must be completed before the issuance of a DPS Temporary Certificate of Occupancy (TCO).

* NOTE: If a DPS inspector (including, but not limited to AABA, boiler, elevator or any other authorized inspector) requires modifications and/or additions that were not included in the construction documents, the Designer should review the applicable code(s) and provide written interpretation to the UMA Project Manager together with their recommendations.

f. Exclusive of other items that the DPS inspector may impose, there is a history of specific items that are essential for, temporary occupancy. These items include, but are not limited to the following:

(1) Properly colored and positioned exit signs.
(2) Properly located emergency lighting fixtures.
(3) Clean ducts, blowers, and coils if units were operated without filters during construction.
(4) Install permanent filters and replace disposable filters if units were operated during construction.
(5) Properly working lock for the medical environmental closets (if applicable).
(6) Assure that exterior and interior fire rated and egress doors are operating properly and have the proper hardware.
(7) Assure that smoke barriers are properly installed and located.
(8) Assure that proper water pressure is provided for the sprinkler system.
(9) Assure that proper hot water temperatures are provided. Unless otherwise specified or required by a User Agency, the temperature set on building master controllers of hot water shall apply:

(a) HW to toilet rooms and janitors closets shall be 140˚ F.
(b) HW to individual tubs or showers shall be controlled, in addition to the master controller above, with thermostatic valves set to furnish HW at a temperature not exceeding 110˚ F and equipped with anti-scald feature.
(c) HW rinse water to dishwashers shall be controlled at 180˚ F.

(10) Emergency eyewash equipment must be hard-plumbed and employ tempered water.

g. Evidence of compliance with requirements of governing authorities including, without limitations, the following:

1) Certificate of Inspection, in form of signed permits from the electrical, plumbing, gas, fire department, boiler, and any other required inspectors.

2) Certification from the local fire department to the effect that all detection, alarm and suppression systems, and other equipment or systems under fire department jurisdiction are approved.

3) When carpeting and/or draperies are provided, a flame, smoke and fuel-rating certificate provided by the supplying General Contractor.

4) Elevator certification(s) from the elevator inspector obtained through the General Contractor’s elevator subcontractor.

5) A letter from the Plumbing Subcontractor that the potable water supply has been sanitized.

6) Septic system certification obtained from the town by the General Contractor (when applicable).

7) Pressurized vessel certifications from the boiler inspector obtained through the Mechanical Subcontractor.

8) When air balancing is required, the air balancing report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable).

9) When smoke control/fire emergency ventilation system is required, the test report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable).

10) Evidence of test and approval for Department of Environmental Protection (DEP) and Department of Public Health (DPH), when applicable.

F. Prerequisites for UMA Certificate of Agency Use and Occupancy: UMA Certificate of Agency Use and Occupancy E-1 Form. Prior to requesting a Division of Capital Asset Management (UMA) Certificate of Agency Use and Occupancy, the UMA Resident Engineer will procure and have ready and available the following approved items (referred to as Closeout Submittals):

1. Operating and maintenance (O & M) manuals and written operating instructions for the various systems.

2. Catalog data sheets for each item of mechanical or electrical equipment actually installed including performance curves, rating data and parts lists.

3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical and electrical equipment controls and fixtures with all details clearly indicated, including size of lamps.


5. Names, addresses, and telephone numbers of repair and service companies for each of the major systems installed under the construction contract.

6. Signed Department of Public Safety (DPS) Certificate of Occupancy per 780 CMR 120.0


9. Subcontractor Affidavits that specified equipment and installed items have been seismically braced in accordance with code requirements.

10. Monetized punch list of the remaining Work that must be done before Final Acceptance.
11. As-built documents should be completed (both electronic files and transparencies) and ready to transfer over to the UMA Project Manager. As-built documents shall consist of, but not be limited to, the following:
   a. Drawings (in AutoCAD ver. 2000 or later format)
      1) Contract drawings, for all disciplines, marked-up to clearly indicate as-built conditions.
      2) All clarification and/or changed conditions sketches (SK’s).
   b. Specifications (in .pdf format)
      1) All construction specifications.
      2) All addenda.
   c. Shop drawings, submittals, etc. (scanned format)*
      1) All approved shop drawings, submittals, etc.

12. Approved documents submitted to the UMA or the Designer shall be electronically scanned (including the associated transmittals and, where applicable, the Designer-of-Record’s and UMA’s comments) as a .pdf document. All scanned approved submittals shall be included on a CD.

13. The electronic file names, for each approved submittal, shall contain the following information:
   a. For APPROVED or APPROVED AS NOTED Shop Drawings:
      1) Project Number Submittal’s Date, APPROVED, Submittal Name, Submittal’s Specification Section Name and Number, and Submittal’s Revision Number.
      2) As an example, the file name of an approved submittal for Concrete
         a) Design Mix: DFS991DC1 030106 APPROVED Concrete Design Mix Cast In Place Concrete 033000 Rev0.PDF
   b. For Shop Drawings submitted for information only, e.g. welders certificate, the electronic file name shall contain the following information:
      1) Project Number Submittal’s Date, FORINFO, Submittal Name, Submittal’s Specification Section Name and Number, and Submittal’s Revision Number.
      2) As an example the file name of a for information only submittal for a welder’s certificate:
         a) DFS991DC1 030106 FOR INFO Welders Certificate Quality Requirements 014000 Rev0.PDF
   c. Unless otherwise stated all submitted documents shall include an electronic scanned image as noted above.
   d. The electronic file name shall be printed on every shop-drawing page.

14. The UMA Project Manager will attach the monetized punch list to the UMA Certificate of Agency Use and Occupancy, indicate the official date of Use and Occupancy, establish the date upon which all remaining punch list items must be completed (normally 30-45 calendar days), and procure appropriate signatures on the original and seven (7) copies.

15. After receipt of signatures, the UMA Project Manager will distribute the signed copies.

16. Project schedules (in Primavera format, unless otherwise authorized), baseline, and all updates.

17. Notification to Operating Agency and/or User Agency of Proposed Use and Occupancy Date: The UMA Project Manager is to notify the Operating Agency and/or User Agency of the project Use and Occupancy date at least seven (7) calendar days in advance.

G. Prerequisites for UMA Certificate of Final Inspection, Release, and Acceptance: UMA Final Certificate of Final Inspection, Release, and Acceptance (E-2 Form). Upon receipt of the UMA Certificate of Agency Use and Occupancy, and its adjunct monetized punch list, the General
Contractor shall cause the completion of all of the other punch list items within timeframe required by said certificate, but not more than 45 calendars days if the timeframe is not indicated on the said certificate.

1. If the General Contractor fails to pursue completion of the remaining monetized punch list work, on a continual basis, within the timeframe required by the certificate, UMA may, after seven (7) calendar days written notice, elect to complete the work with separate forces and charge the work against the General Contractor.

2. At the end of the General Contractor’s one (1) year guarantee period, the General Contractor shall transfer manufacturers’ equipment and material warranties that are still in force to the Operating Agency.

1.8 GUARANTEES AND WARRANTIES

A. Submit to the Designer all extended guarantees and warranties that have been specified in various, individual Sections of the Specifications. Guarantees shall be assembled by Specification No. and Section in accordance with Specifications Table of Contents.

   1. Guarantees and warranties shall be enforceable in the Commonwealth of Massachusetts and subject to interpretation in accordance with the laws of the Commonwealth of Massachusetts.
   2. Guarantees and warranties shall begin at the date of Substantial Completion of the Project. Guarantees and warranties which start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

B. Unless more stringent requirements are otherwise specified, guarantee all work against defects of materials, equipment and workmanship for one year from the date of Substantial Completion or the date of issue of Certificate of Use and Occupancy for the building or portion thereof, whichever occurs first.

C. If, within any guarantee period, repairs or changes are required in connection with guaranteed work, General Contractor shall promptly upon receipt of notice from UMA, and without additional expense to UMA, within ten business days:

   1. Place in satisfactory condition in every particular all guaranteed work and correct all defects.
   2. Make good all damage to building, site equipment, or contents thereof, including redecoration which, in the opinion of the Designer, results from the use of material, equipment or workmanship which are inferior, defective or not in accord with the terms of the Contract.

D. If General Contractor, after such notice, fails to proceed immediately to comply with terms of guarantee, UMA may correct defects and hold General Contractor liable for all expenses incurred.

E. Promptly after completion of the work, obtain from each Subcontractor where a guarantee is required, a warranty addressed to and in favor of UMA or the User Agency if directed by UMA.

F. Delivery of any warranty required does not relieve the General Contractor from any obligation assumed under other provisions of the Contract.

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G. Deliver guarantees and warranties to the Designer before or with the application for Final Payment.

H. The general warranty set forth in the General Conditions is in addition to, exclusive of, and not in substitution of such guarantees as may be required in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
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 existing batten system and equipment
2. Demolish existing endzone scoreboard and signage.
3. Demolition and removal required to install the new steel through existing grid iron. Refer to the Drawings for additional requirements.
4. Demolition and removal of selected portions of buildings and structures and as required for new work; includes batten system. Refer to the Drawings for additional requirements
5. Demolition of existing scoreboard and anchoring steel at Garber Field (add alternate).
6. 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 her/his expense. Salvage value belongs to the Contractor. On-site sale of materials is not permitted.
7. Demolition and removal work shall properly prepare for alteration work and new construction to be provided under the Contract.
8. Scheduling and sequencing operations without interrupting utilities serving occupied areas. If interruption is required, obtain written permission from the utility company and the UMA Project Manager. Schedule interruption when the least amount of inconvenience will result.

B. Alternates: Refer to Section 012300 - Alternates for alternates which affect the Work of this Section.

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 015000 - TEMPORARY FACILITIES AND CONTROLS:
   a. Maintenance of access, cleaning during construction, dust and noise control.
2. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL:
   a. Waste management and recycling.
3. Section 230500 – COMMON WORK RESULTS FOR HVAC:
   a. Disconnecting, capping and otherwise making inactive existing mechanical services in areas where demolition and removal work is required. Mechanical tradesmen will disconnect, cap, inactivate and lower to floor such items where required to be removed under Section 230500 – COMMON WORK RESULTS FOR HVAC. Removal and disposal of such materials shall be then done under this Section 024100 - DEMOLITION.
   b. Disconnect and reinstallation of HVAC equipment temporarily interrupted during construction.
4. Section 260001 - ELECTRICAL WORK:
   a. Disconnecting, capping and otherwise making inactive existing electrical services in areas where demolition and removal work is required. Electrical tradesmen will disconnect, cap, inactivate and lower to floor such items where required to be removed under Section 260001 - ELECTRICAL WORK. Removal and disposal of such materials shall be then done under this Section 024100 - DEMOLITION.
   b. Disconnect and reinstallation of electrical equipment temporarily interrupted during construction.

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 User Agency ready for reuse, at a location designated by the User Agency. Protect from weather until accepted by User Agency.

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 UMA that may be encountered during selective demolition remain property of the Commonwealth or user Agency as applicable. Carefully remove each item or object in a manner to prevent damage and deliver promptly to a location acceptable to the UMA Project Manager.

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 User Agency'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.


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 to the User Agency.

C. Predemolition Videotapes: 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. Submit before Work begins.

D. Landfill Records: Provide trip tickets (receipts) indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1. Comply with submittal requirements in Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

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. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

E. Standards: Comply with ANSI A10.6 and NFPA 241.

F. Predemolition Conference: Conduct conference at Project site to comply with requirements in Section 013100 - PROJECT MANAGEMENT, COORDINATION AND COMMISSIONING.
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 (Not Used)

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 Designer.
E. Engage a professional engineer registered in the Commonwealth of Massachusetts 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 User Agency.
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 Protection, 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 Designer. Do not proceed with work in such areas until instructions are issued by the Designer. 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 015000 - 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 Designer 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.

D. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

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 and after 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. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

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 User Agency.
4. Transport items to storage area designated by the UMA Project Manager.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Designer, 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, reused, or turned over to the Owner prior to its removal, and immediately report damages and defects to the Designer and UMA Project Manager. 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 Designer, to the satisfaction of the UMA Project Manager.
   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 Commonwealth’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 Designer, and to the satisfaction of the UMA Project Manager.

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, structures, 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.

G. Protect unaltered portions of existing construction, including finishes, furnishings and equipment

H. Provide secure weather protection where demolition has removed a portion of the exterior envelope.

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 Designer and the UMA Project Manager of such discovery. Do not proceed with work in such areas until instructions are issued by the Designer. 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 Designer and the UMA Project Manager of such discovery. Do not proceed with work in such areas until instructions are issued by the Designer. 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.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Comply with requirements of Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL 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
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 Steel for this Project is that work defined in the 6/10/92 edition of AISC’s – Code of Standard Practice for Steel Buildings and Bridges, Section 2.1 in its entirety plus the following:
   a. Structural steel.
   b. Metal parts that are to be shop attached to structural steel, including but not limiting to: connection plates and shapes, plates, fittings and holes required for the assembly or erection of materials and equipment supplied by trades other than structural steel. Coordinate shop attached items required and details with the other affected trades.
   c. Metal parts and connectors shown on the Structural Contract Drawings, except those normally supplied/installed by another trade. The work includes steel elements of structural steel frame essential to support design loads and consisting of material shown on Drawings and described as follows:
      1. Bases or Bearing Plates
      2. Beams, Girders
      3. Columns, Posts, Hanger Posts or Struts
      4. Bracings
      5. Connecting Material for Framing Structural Steel to Structural Steel.
   d. Shop primer for structural steel.
   d. Shop paint and field touch up for structural steel.
   e. Field surface preparation and touch up of all blemishes on all affected existing framing/grid iron and all newly installed members and connections.

2. Furnish all labor, material, plant, transportation, equipment accessories, appurtenances, and services necessary and/or incidental to the proper completion of all steel work shown on the Contract Drawings, described in the specifications, or as reasonably inferred from either, in the opinion of the Architect, as being required.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: None
D. Items To Be Furnished Only: None

E. Related Work:
1. Section 099000 - PAINTING AND COATING. Reference section for submittal, materials, surface preparation, application and field touch up for shop applied finished paint to the structural steel.

F. Hoisting Equipment: This Contractor shall furnish, install and maintain in safe and adequate condition all mechanical hoisting equipment, operating personnel and rigging that is necessary for the proper execution of the Work of this Section.

G. Staging, Planking and Scaffolding: This Contractor shall furnish, install and maintain in safe and adequate condition all staging, planking and scaffolding that is necessary for the proper execution of the Work of this Section.

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.

B. Contractor: All Trades involved in the execution of this section of the specifications.

1.4 PERFORMANCE REQUIREMENTS
A. Construction: Type PR, partially restrained.

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. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
   3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
   4. Prior to submittal to the Architect, all shop drawings shall be reviewed by the Contractor for general conformance to the Construction Documents and for coordination with other disciplines/trades. All non-conformance drawings shall be sent back to the steel fabricator for correction prior to submittal to the Designer. Interferences with other disciplines/trades shall also be noted to the shop drawings.
   5. For shop primer and paint system, submit information requested under appropriate paragraphs of Specification Section 099000 for review.

C. Welding certificates.
   1. Provide welder certifications for all welders to be employed on this Project. Certification of welders shall be the responsibility of the Contractor.
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.

F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. The work shall be performed in accordance with the requirements of the Massachusetts State Building Code (MSBC), Eight Edition, 2009 International Building Code, American Institute of Steel Construction (AISC), and OSHA regulations, supplemented by the Contract documents.

B. Reference Standards:

1. American Institute of Steel Construction
   a. Code of Standard Practice for Steel Buildings and Bridges
      i. Paragraph 4.2.1 of code is modified by deletion of following sentence: “This approval constitutes the Owner’s acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as part of his preparation of these shop drawings.”
   b. Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings, including Commentary and Supplements as issued.
   c. AISC Specifications for Structural Joints using ASTM A325 or A490 Bolts, approved by Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

2. American Welding Society
   a. AWS D1.1 Structural Welding Code

3. American Society for Testing and Materials
   a. ASTM A36 Structural Steel
   b. ASTM A108 Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
   c. ASTM A307 Specifications for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
   d. ASTM A325 High Strength Bolts for Structural Steel Joints
   e. ASTM A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
   f. ASTM A576 Specifications for Steel Bars. Carbon, Hot-Wrought, Special Quality
   g. ASTM F436 Specification for Hardened Steel Washers
C. Qualifications:

1. Fabrication:
   a. Company specializing in performing the work of this section with minimum 10 years experience.
   b. A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Cbd.

2. Erector:
   a. Company specializing in performing the work of this section with minimum 10 years’ experience.
   b. A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

3. Welding Work:
   a. Qualify welding processes and welding operators according to AWS Standard Qualification Procedure.
   b. Provide certification welders to be employed in Work have satisfactorily passed AWS qualification tests.
   c. If recertification of welders is required, retesting will be Contractor’ responsibility and at no cost to the owner.

D. Required Designs by Contractor:

1. Where “designs” are required of the Contractors by the Contract Documents, the designs shall be performed by competent, qualified and experienced professional Structural Engineers, registered in the Commonwealth of Massachusetts. Such designs shall be prepared in a design document format (not a shop drawing format), be stamped and signed by the professional Engineer who performed the design and, where specifically requested, be submitted to the Architect for record purposes only. In addition, the professional Engineers retained by the Contractor to perform the designs required by the Contract Documents shall review the shop drawings associated with their designs and visit the manufacturing facility or fabricating plant and the construction site to observe that the work is being performed in accordance with their designs. The costs associated with their designs, materials and labors shall be borne by the Contractor. The responsibility for designs required of the Contractors shall remain solely with the Contractors.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1. Before commencing steel erection, request for a conference to ensure quality installation. Require representatives of each entity directly concerned with structural steel erection to attend, including the following:
   a. Construction Manager Superintendent, Contractor Superintendent and the Structural Steel Contractor's superintendent.
   b. Independent testing agency responsible for structural inspection and testing.
   c. Structural steel fabricator.
   d. Other trade Contractors that have direct interface with structural steel.
2. Review pre-erection survey and discuss out of tolerance issues impacting the steel erection.
4. Review inspection and testing requirement, schedule and coordination.

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. Materials:
   1. All materials shall be new and un-spliced.
      a. For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness.
      b. Remove such blemishes by grinding, or by welding and grinding, before cleaning, treating, and application of surface finishes.

B. W-Shapes: ASTM A 572, Grade 50.

C. Channels, Angles, M, S-Shapes: ASTM A 572, Grade 50.

D. Plate and Bar: ASTM A 36

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

H. High-Strength Steel Castings: ASTM A 148, Grade 80-50, carbon or alloy steel.

I. 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: Unfinished or factory finished. Field touch up with paint.

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: Unfinished or factory finished.

C. Washers for anchor bolts and fasteners: Flat circular hardened washers, square or rectangular hardened beveled washers and square or rectangular flat plate washers as follows:

1. Hardened steel washers: ASTM F436, used where standard or short slotted holes are in the outer plies of the connections.
2. Plate washers: ASTM A36, 5/16” minimum thick with standard holes used where oversized or long slotted holes are in the outer plies of the connections. Size plate washers to completely cover holes

D. Threaded Rods: ASTM A 193/A 193M, grade as applicable, hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.3 FABRICATION


1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
6. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
7. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
8. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

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. Holes for other works: 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.

2.4 SHOP CONNECTIONS

A. Connections not shown on the Structural Contract Drawings shall be designed by a professional structural engineer registered in the Commonwealth of Massachusetts and well versed in steel connection design and retained by the steel fabricator. Use Allowable Stress Design (ASD) when design of connection includes one or more un-factored reactions.
   1. Weld or bolt shop connections, as indicated.
   2. Bolt field connections, except where welded connections or other connections are indicated.
   3. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.

B. 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: Snug tightened, unless noted otherwise.

C. 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.

2.5 STEEL PRIMERS AND FINISH COAT

A. Shop Primer:
   
1. Primer: One-component aromatic polyurethane containing iron oxide and zinc filled primer such as PerimePrime Series 394 by TNEMEC, or approved equivalent, compatible with selected finish paint coats and/or fire proofing. Refer to Painting and Coating Section 099000 for finish paint coat systems.

B. Primer touch up paint: Shall be compatible with shop primer and shall not exceed the VOC content limit of 250 g/L.

C. Shop prime all steel surfaces except the following:
   
1. Surfaces to be field welded.
2. Surfaces to be high-strength bolted with slip-critical connections.

D. 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. Interiors (SSPC Zone 1A): SSPC-SP 6, "Commercial Blast Cleaning."
3. Comply with SSPC-PA 2, "Measurement of Dry Coating Thickness with magnetic Gages."

E. 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 for rooms 148, 148C, and 148D.

F. Finish Coat system: One coat of the following.
   
1. Tnemec 115 WB Unibond at 2.5 to 3.0 mils DFT
2. PPG PMC Amercoat 220 Acrylic at 3.0 mils DFT
3. RD Metal Unicoat at 2.5 to 3.0 mils DFT

G. Confirm compatibility between the primer and the finish coat. Please indicate compatibility between the primer and the finish coat system in the submittal for review.

H. Finish coat touch up paint: Same with shop paint. Field touch up all damaged coating to all affected existing framing/grid iron, all new structural steel and all connections (bolts and weldment) at completion of the structural steel erection.
2.6  SOURCE QUALITY CONTROL

A. Engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Alternatively, the fabricator may submit valid plant certification by a recognized certifying agency, e.g. AISC. Such certification shall be not more than two years old.

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.

1. All Welds – 100% visual. Acceptance criteria AWS D1.1 Table 6.1
2. Fillet welds – One 6 inch test per 50 linear feet of weld deposited by each welder. Alternately use MT and DPT. Acceptance criteria – AWS D1.1, paragraph 6.10.

E. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures to meet specified requirements.

F. Promptly remove and replace materials or fabricated components that do not comply.

G. Design of Members and Connections:

1. Details shown are typical; similar details apply to similar conditions, unless otherwise indicated.
2. Verify dimensions at site whenever possible without causing delay in Work.
3. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing steel sizes, dimensions and elevations prior to erection.

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. Thermal cutting of existing members to facilitate installation of new structural steel shall be done safely and with care. Finish thermally cut sections within smoothness limits in AWS D1.1. Coordinate with the Owner’s Representative safety officer for required protection and safety procedure prior to conducting any thermal cutting.

F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

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: Snug tightened.

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.

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.

5. All field welds that are exposed to view shall be continuous and be ground smooth.

3.5 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by UMBA 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.

D. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Welded Connections: Dimensional tolerances for welded construction, details of welds, and quality of welds shall be in accordance with the applicable requirements of AWS D1.1 and the contract drawings. Nondestructive testing shall be by visual inspection, and ultrasonic, magnetic particle, or dye penetrant methods.

   1. All Welds – 100% visual. Acceptance criteria AWS D1.1 Table 6.1
   2. Fillet welds – One 6 inch test per 50 linear feet of weld deposited by each welder. Alternately use MT and DPT. Acceptance criteria – AWS D1.1, paragraph 6.10.

F. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Defective Work:

   1. Correct deficiencies in structural steel Work that inspections and laboratory test reports have indicated does not meet requirements at no expense to the owner.
   2. Perform additional tests, at Contractor’s expense, as may be necessary to reconfirm any noncompliance of original Work, and as may be necessary to show compliance of corrected Work.

B. Touchup Painting: After installation, promptly clean, prepare, and prime, re-prime and top coat all existing affected steel framing/grid iron, new structural steel, field connections, rust spots, 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 and paint of same type as paint system used on adjacent surfaces.

END OF SECTION
SECTION 092116
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, typically patching at areas disturbed by new construction.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 099000 - PAINTING AND COATING for field applied coatings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 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.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
1. Deliver and store materials in accordance with Gypsum Association Publications GA-216, GA-238 and GA-801.

B. 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.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 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 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch.

B. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

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. USG Corporation.
b. Georgia Pacific Gypsum.
c. Lafarge North America.

B. Fire-Resistant Type X:
1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

2.4 TRIM ACCESSORIES
A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

2.5 JOINT TREATMENT MATERIALS
A. General: Comply with ASTM C 475/C 475M.
B. Joint Tape: Paper.
C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use 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.

2.6 AUXILIARY MATERIALS
A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
B. 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 backer units, use screws of type and size recommended by panel manufacturer.
C. Acoustical Sealant: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Acoustical Sealant for Exposed and Concealed Joints:
      a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
3. Acoustical Sealant for Concealed Joints:
   a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
   b. Pecora Corp.; BA-98.

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 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, 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.

3.3 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.

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.

3.4 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.
   1. Cutting and Patching: Use tools appropriate for cutting and patching drywall and metal studs. Joints in patched areas shall always occur over studs. Joints shall not be visible in the finished work when viewed from a distance of 5 feet.

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.

3.5 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 Designer 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.

3.6 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. GA Level 1: Ceiling plenum areas and concealed areas not exposed to view.
2. GA Level 4: Panel surfaces that will be exposed to view (typical panels).

3.7 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 099000
PAINTING AND COATING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 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. Painting of the three existing wide-flange support columns at Garber Field.
2. Painting of drywall walls in areas of remodeling at the production room.

B. Alternates: Refer to Section 012300 - Alternates for alternates which affect the Work of this Section.

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 051200 - STRUCTURAL STEEL FRAMING for shop-finishing of structural steel; includes field touch-up if items are abraded or damaged during installation.

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 a 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, Designer 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, prefinished metal surfaces, operating parts, and identification labels.

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. 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 eight inch by 12 inch Samples for each type of finish coating for Designer'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. 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. Designer 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: Designer 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, Designer 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.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Furnish four unopened gallons of each type of paint and coating work, in color and gloss as used for the Project.

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.

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 Designer 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. 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. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

3. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density. 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 back sides of access panels and removable or hinged covers to match exposed surfaces.

8. Finish exterior doors 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. 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 UMA Project Manager reserves the right to invoke the following test procedure at any time and as often as the UMA Project Manager deems necessary during the period when paint is being applied:

1. The UMA Project Manager 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. Refer to Section 014325 - TESTING AGENCY SERVICES for additional requirements.
2. Testing agency will perform appropriate tests for the following characteristics as required by the UMA Project Manager.
3. The UMA Project Manager 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 Designer.

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. Existing Exterior Painted Steel for Sandblasting and Finish (existing exterior wide-flange support columns at Garber Field scoreboard): (Surface Preparation- SSPC-SP 10 Near White Metal Blast)
   
   One Coat
   1. Tnemec 90-97 or 901K97 at 3 to 3.5 mils DFT
   2. PPG PMC Amercoat 68 HS at 3.0 mils DFT
   3. Dupont Ganicin 80% Zinc load Zinc Rich Primer at 3.0 to 3.5 mils DFT

   And One Coat
   1. Tnemec 1075 Endura-Shield at 3.0 to 4.0 mils DFT
   2. PPG PMC Amerlock 400 at 4.0 DFT
   3. Dupont Imron 2.8 at 4.0 to 5.0 mils DFT

   And One Coat
   1. Tnemec 1070V or 1072V Flouronar at 2.5 to 3.5 mils DFT
   2. PPG PMC Corolon Coating at 5.0 mils DFT
   3. Dupont Fluoropolymer at 3.0 mils DFT

C. Interior Paint Schedule:

1. Interior Gypsum Wallboard Walls for Latex Eggshell Finish:

   One Coat
   1. Moore Eco Spec WB Interior Latex Primer (372)
   2. Duron Genesis Latex Primer
   3. S-W Harmony Latex Wall Primer
   4. PPG Pure Performance Latex Primer
   5. Glidden Professional Lifemaster No VOC Latex Primer (9116)

   And Two Coats
   1. Moore Eco Spec WB Interior Latex Eggshell (374)
   2. Duron Genesis Latex Eggshell
   4. PPG Pure Performance Latex Eggshell
   5. Glidden Professional Lifemaster No VOC Latex Eggshell (9300)

END OF SECTION
SECTION 11 52 00 – SPECIAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. The disciplines included in this section are:
   1. LED display systems
   2. Signage and aesthetic elements
   3. LED processing and control
   4. Center Hung Hoist
   5. Audio system.

1.2 DESCRIPTION

A. The Contractor shall be responsible for providing all LED equipment, signage and audio equipment as described.

B. The Contractor shall be responsible for the provision and installation of all secondary structural steel, mounting brackets, and hardware required to accommodate the new system(s). This includes all labor, materials, equipment, tools, transportation, and project management required to complete a fully operational system(s) on the project.

C. Contractor shall be responsible for assembly, secondary modifications (if necessary) and mounting of all audio and video components onto new or existing structures.

D. Primary Power will be provided by others at defined demarcation points as shown on the project electrical drawings. Contractor shall be responsible for all power and electrical distribution from demarcation point (Secondary Power) to new system(s). Contractor shall provide all Secondary Power connections/terminations required to power new system(s).

E. Conduits and/or raceways will be provided by others as shown on the project electrical drawings for all low voltage. All additional conduit and raceways required to complete a path to each LED and audio component shall be furnished and installed by Contractor. Contractor shall be responsible to furnish, install, and terminate all required cabling needed to make new system(s) complete and fully operational.

F. Contractor shall grant a license to use all proprietary software provided with this RFP for the life of the system.

G. All equipment and materials shall be new (latest version at time of bid) and shall conform to applicable UL, CSA, or ANSI provisions. Re-manufactured or “B” stock equipment will not be accepted without prior written consent from the project. Evidence of unauthorized re-manufactured or “B” stock equipment on the project site will be deemed evidence of the Contractor's Failure to Perform the Work. Take care during installation to prevent scratches, dents, chips or disfiguration.

H. All audio equipment power circuits must have an emergency back-up system as deemed necessary per the local/state fire code; whichever is more restrictive.
1.3 VENDOR QUALIFICATIONS

A. Vendor shall provide a list of a minimum of three (3) facilities (facility, contact name, title, address and current phone number) where the vendor has provided equipment and services of equivalent size and scope within the last five (5) years.

B. Vendor shall provide a minimum of one (1) facility (facility, contact name, title, address and current phone number) where the vendor has provided equipment and services of equivalent size and scope that is at least five (5) years old.

C. Vendor shall be required to provide a Letter of Surety from their bonding agent, stating their ability to provide a 100% payment and performance bond if they are the successful bidder.

D. Vendor shall have a direct service employee or certified contractor capable of providing maintenance response within 8 hours of a call for service.

1.4 SUBMITTAL REQUIREMENTS

A. Initial Submittals and Shop Drawings

1. Contractor shall be required to provide submittals and shop drawings within thirty (30) calendar days of date shown on award notice. Contractor shall be responsible to ensure that the dimensions and specifications of each component and all systems fit within the building allowances. Contractor shall advise of any discrepancy that could affect installation. If Contractor fails to notify any discrepancies, Contractor shall assume responsibility for providing the required equipment or correcting such discrepancies at no additional cost. The following required submittals will be defined by the guidelines established and shall include but not be limited to:

a. Three (3) sets of shop drawings, product data and samples together in one package within thirty (30) calendar days of date shown on Award Notice to Contract and prior to ordering equipment.

b. Catalog data sheets, neatly bound with title page, space for submittal stamps, and tabbed dividers between Sections. Provide a complete list of proposed equipment with reference to its corresponding specification paragraph number or equipment title in specification paragraph order. Denote all approved substitutions.

c. Point-to-point wiring diagrams and typed wire lists identifying every connection. Include electronic devices such as switches, transformers and terminal blocks. Indicate locations of all components. Identify cables by types, colors and wire numbers. Complete, detailed wiring diagrams for the systems, based on the contract documents but including cable types, identification and color codes, and detailed wiring of connections, both at equipment and between equipment racks and wiring conduit, connector types, expansion loops and cable lengths. Drawings shall comply with ANSI and International Electrotechnical Commission recommendations and standards as appropriate. Provide drawing set cover sheet clearly dimensioning all cable preparation details for each cable type and connector utilized in the system.

d. Structural engineered drawings for all secondary steel framing required for this scope of work. Structural drawings submitted shall include attachments to primary steel structure. Structural engineered drawings shall also include method of attachment for all audio components required for this scope of work. A licensed/registered engineer in the State or Commonwealth where this project is located shall stamp all structural drawings.

e. Conduit riser diagrams showing required conduits and junction boxes along with types of quantities of cables to be contained in each conduit. Show details of
weatherproofing, lightning protection and grounding, strain relief and cable support, fire stop protection, and wall penetrations through all rated partitions.

f. Rack layouts indicating the proposed arrangement of mounted equipment including power junction box location and locations of conduit penetrations. Rack layouts shall include front and rear views. BTU loads for each piece of equipment should also be included on the rack layout drawing.

g. Detail drawings of all custom fabricated items and approved equipment modifications. Include complete parts lists, schematic diagrams, and all dimensions required for proper assembly.

h. Proposed color selections and finishes for all exposed surfaces and custom fabricated items. Submit actual color/finish samples, wall plates, and custom labels.

i. A list of all lower tier subcontractors and suppliers. List shall include lower tier subcontractor’s qualifications indicating performance of similar work on past projects of this type and scope.

j. A project schedule in Gantt Chart format outlining equipment delivery dates and installation start and finish dates. Project schedule shall be broken down into sufficient detail (work task and duration).

k. Copies of all required business and contractor licenses.

l. Copies of proof of insurance.

2. Approval of submitted items indicates only the acceptance of the manufacturer and quality. Specific requirements, arrangements, and quantities shall comply with the intent of the Contract Documents unless specifically approved in writing.

3. Submittals that are incomplete, deviate significantly from the requirements of the Contract Documents, or contain numerous errors will be returned without review for rework and re-submittal, and may result in back charges to the Contractor.

B. Contract Closeout Submittal:

1. When the installation is substantially complete including the Testing Reports in Part 3 of this Section, Contractor shall submit two (2) complete initial hard copy sets of contract closeout submittals for review. After review and approval of initial set, Return of one (1) initial hard copy to Contractor with comments for updating. Contractor shall provide four (4) final sets of closeout submittals and one (1) electronic copy in PDF format. Closeout submittals shall include, but not be limited to:

   a. Project Record Drawings (As-Built Drawings) including final secondary steel structural drawings, electrical drawings, and system block diagrams, rack layout drawings and wiring schedule.


   c. A list of all equipment provided and its location within the facility. List shall include manufacturer name, model identifier, serial number, and any other pertinent information needed to obtain service, maintenance, and/or replacement.

   d. A list of all Subcontractors who performed work for Contractor during installation. List shall include company name, physical company address, phone number, and contact person(s).

   e. Copies of all software, settings and programs used in the control and operation of this system.

   f. Copies of all equipment registration documentation.
g. Test reports from an independent testing & inspection agency certifying that bolted and/or welded connections for primary secondary structural steel meet the minimum requirements of the engineered structural drawings, the governing building code, or as required by the building official; whichever is more restrictive.

h. All testing reports as specified in Section 3.8 – Testing and Acceptance.

i. Test reports for all new fiber optic cable installed under this scope of work. Test reports shall indicate end to end signal loss does not exceed a maximum dB loss per Section 3.7.K and/or 3.7.L.

C. Operation & Maintenance Manual

1. Upon substantial completion but prior to onsite training, Contractor shall provide four (4) final Operation & Maintenance Manuals (O&M Manuals). O&M Manuals shall have tab dividers and shall be logically organized to provide easy access to information without the need to research through entire manual. All documents provided in the O&M Manual shall be written in English and shall provide sufficient detail as to be understood by an individual with no knowledge of audio components or the associated control equipment and/or operating systems. Contents of the O&M Manual shall include, but not be limited to:

a. Table of Contents

b. Description / overview of system(s) including key features and operational procedures.

c. Full start up procedure for all control room rack equipment and any additional audio components written under the assumption that all equipment was in full powered off mode.

d. Full shutdown procedure for all control room rack equipment and any additional audio components written under the assumption that the facility is in an extended power failure situation.

e. Owner’s Manuals for all third party and/or “off the shelf” type equipment provided by Contractor; e.g., KVM’s, fiber modems, network switches/routers, and UPS battery backups.

f. Small scale plans showing locations and circuit numbers for all system outlets and receptacles.

g. Single-line block diagrams showing all major components of the systems.

h. All third party equipment and/or “off the shelf” equipment warranties and a notarized System Warranty.

1.5 EQUIPMENT GENERAL SPECIFICATIONS

A. All equipment and materials shall be new and the latest version at the time of bid and shall conform to applicable UL, ULC, CSA or ANSI provisions. Re-manufactured or “B” stock equipment will not be accepted without prior written consent. Evidence of unauthorized re-manufactured or “B” stock equipment on the project site will be deemed evidence of the contractor’s failure to perform the work. Contractor shall take care during installation to prevent scratches, dents, chips or disfiguration of equipment and materials supplied. All damaged equipment and/or materials shall be repaired or replaced.

B. All cabling [power and data] is to be labeled at each end of the cable with a description in English OR with a reference to a wire designation on a wiring diagram. These diagrams must be part of the Project documentation submitted at time of acceptance.
C. Each device shall meet all of its published manufacturer’s specifications. Verify performance as required.

D. Provide an uninterruptable power supply (UPS) at the bottom of each rack supplied by Contractor. UPS shall have the capability of providing power to all equipment within the rack for a period of 15 minutes in the event of a power failure at the facility.

E. Install all rack mounted equipment with Middle Atlantic Products HP Series truss head screws, or approved equal.

F. Some rack-mounted equipment may require shaft locks, security covers, or removal of knobs; provide and install during Acceptance Testing.

G. Provide engraved self-adhesive lamicoid labels at the front and rear of all rack-mounted signal processing equipment. Mount labels on the equipment chassis and attach in a neat and permanent manner. Embossed label will not be accepted. Label equipment with schematic enumeration reference, and with descriptive information regarding its function or area it is serving. Similarly, provide engraved labels at the rear only of equipment mounted in furniture consoles.

H. All engraving shall be 1/8” block lettering unless noted otherwise. On dark panels or pushbuttons, letters shall be white. Letters shall be black on stainless steel, brushed natural aluminum plates or light-colored pushbuttons.

I. Per IEC-268 standard, all XLR connectors not mounted on equipment shall be wired pin 2 hot (high), pin 3 low, and pin 1 screen (shield).

J. Mounting Hardware exposed to the weather shall be aluminum, brass epoxy painted galvanized steel or stainless steel. Apply corrosion inhibitor to all threaded fittings.

K. Equipment Racks shall be Middle Atlantic Products model MRK-4436, or approved equal, with accessories as noted below. Quantity of racks shall be as required to house all equipment supplied under this scope of work. Any unused rack mounting spaces shall have blank panels to fully enclose the rack assembly. Multiple racks shall be anchored together using appropriate ganging hardware. Standard solid rear door shall be replaced with Middle Atlantic Products model MW-VRD-44 vented rear door.

1. Provide two (2) side panels per individual stand-alone rack or series of racks ganged together. The intent is to have an enclosed rack system. A single stand-alone rack would have two (2) side panels and a series of three (3) racks ganged together would also have two (2) side panels. Side panels shall be Middle Atlantic Products model SPN-44-36, or approved equal.

2. Provide Middle Atlantic Products model MW-4QFT-FC integrated fan top, or approved equal, for each rack. Fan shall be thermostatically controlled to ensure in-rack temperatures of less than 100 degrees Fahrenheit.

3. Provide two (2) Middle Atlantic Products model LT-GN-PL gooseneck work lights for each rack required for this scope of work.

4. Provide Middle Atlantic Products model PDT-2X1020T, or approved equal, in rack vertical power strip. Power strip shall have enough receptacles to accommodate all equipment housed in the associated rack with a minimum of two spare receptacles per rack.

L. Any rear mounted rack equipment shall be placed so the equipment does not block access to the back of front mounted equipment.
M. Contractor shall exercise care when wiring racks to avoid damaging cables and equipment. Contractor shall install grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.

N. Equipment Racks shall have a ground buss installed in each rack. Ground buss shall be insulated from the rack. Attach equipment rack to ground buss at one point using #4 insulated copper wire. Ground any equipment chassis without a three-conductor power cord directly to the buss bar using #12 insulated copper wire. Tie each and every power receptacle ground contact to the buss bar using #12 insulated copper wire. Interconnect signal cables shall be routed from junction boxes through metallic flexible conduit(s) (1” to 2” diameter) as appropriate. Flexible conduit shall be insulated from racks by approved insulating bushings.

O. Power wiring and signal/data wiring shall be installed on opposite sides of rack. Contractor may determine which side is used for power and which side for signal. Method shall be kept the same for entire installation, if multiple racks are required. Contractor shall exercise care when wiring racks to avoid damaging cables and equipment.

1.6 QUALITY ASSURANCE

A. All requirements of the latest published editions of the following standards shall apply, unless otherwise noted. In the event of conflict between cited or referenced standards, the more stringent shall govern.
   1. National Electric Code (NEC)
   2. National Electrical Manufacturers Association (NEMA)
   3. American National Safety Institute (ANSI)
   4. Occupational Safety and Health Administration (OSHA)
   5. American Iron and Steel Institute (AISI)
   6. Underwriters Laboratories (UL)
   8. Society of Cable Television Engineers (S.C.T.E.)
   9. Society of Motion Picture and Television Engineers (S.M.P.T.E.)
  10. American Society of Testing Materials (A.S.T.M.)
  11. National Cable Television Association (N.C.T.A)
  12. Electronic Industries Association (E.I.A.)
  13. Telecommunications Industries Association (T.I.A.)

B. Review all architectural, civil, structural, mechanical, electrical, and other project documents relative to this work.

C. Verify all dimensions and site conditions prior to starting work.

D. Coordinate the specified work with all other trades.

E. Maintain a competent supervisor and supporting technical personnel, acceptable to the Project during the entire installation. Change of supervisor during the project shall not be permitted without prior written approval from the Project.
F. Provide all items not indicated on the drawings or mentioned in the specifications that are necessary, required or appropriate for this work to realize a complete and fully operational system that performs in stable and safe manner.

G. Review project documentation and continuously make known any conflicts discovered and provide all items necessary to complete this work to the satisfaction of the Project without additional expense. In all cases where a device or item or equipment is referred to in singular number or without quantity, each such reference shall apply to as many such devices or items as are required to complete the work.

H. Provide additional support or positioning members as required for the proper installation and operation of equipment, materials and devices provided as part of this without additional cost.

I. Regularly examine all construction, and the work of others, which may affect Contractors work to ensure proper conditions exist at site for the equipment and devices before their manufacture, fabrication or installation.

J. Contractor shall be responsible for the proper fitting of the systems, equipment, materials, and devices provided as part of this work.

K. Promptly notify in writing of any difficulties that may prevent proper coordination or timely completion of this work. Failure to do so shall constitute acceptance of construction as suitable in all ways to receive this work, except for defects that may develop in the work of others after its execution.

L. After installation, submit photographs showing cable entries and terminations within equipment racks, enclosures and pedestals at the job site.

1.7 WARRANTY AND SERVICE

A. Contractor shall warrant labor and materials for twenty-four (24) months following the date of Final Acceptance.

B. During the warranty period the system shall be free of defects and deficiencies and conform to the drawings and specifications with respect to the quality, function, and characteristics stated.

C. Contractor shall repair or replace defects that occur in labor or materials within the warranty period.

D. On-site labor shall be included during the warranty period for any work beyond simple component replacement. Simple component replacement shall be defined as all equipment that does not require tools to perform the equipment replacement.

E. Failed parts shall be returned to the Contractor for repair at a service facility located in the United States. Contractor shall identify the location of its service facility in the documentation provided when submitting a bid for this work.

F. The Contractor shall replace failed parts that cannot be repaired.

G. Upon receipt of a failed part, Contractor shall return a repaired or replacement within fifteen (15) business days from receipt of failed part.
H. Contractor shall supply at least one local service employee or local authorized service agent for service and repair of all equipment during the warranty period. Local service employee or local authorized service agent shall be located within 75 miles of facility.

I. The local service employee or local authorized service agent shall be the entity responsible for providing the following emergency response availability:

1. Telephone service assistance and technical support from 8am to 11pm local time 7-days per week.

2. Answer all service calls and requests for information within one (1) hour during the warranty period.

3. The advance replacement should contain all of the shipping information and packaging necessary to return the defective part or assembly back to Contractor at no cost.

J. Warranty shall cover all equipment, including processors, controllers, operating systems, and software.

K. Warranty shall include two annual on-site system check-ups by a qualified technician who is a full-time employee of the Contractor. Visit to occur approximately 2-3 weeks prior to the start of the second and third seasons.

L. Check-up shall include all regular maintenance; including filter cleaning, a complete inspection of all systems, parts replacement where required and a complete written report of all findings.

END OF PART 1 GENERAL
PART 2 PRODUCTS

2.1 LED VIDEO DISPLAYS

A. Mullins Center – Center Hung LED Video Display

1. Quantity: Two (2) Indoor Video Displays
2. Pixel Resolution: 10mm physical pixel resolution.
3. LED Supplier: Only Nichia, Cree or Multicolor LED’s will be accepted.
4. Minimum Active Area of Displays: 15.74’ tall by 27.8’ wide.
5. Minimum Resolution: 480 x 848 based on maximum pixel pitch of 10mm.
6. Minimum Brightness: 2000nits (100% white with automatic color-correction "on") at startup.
7. System must maintain a minimum brightness level of 1500nits throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.
8. Display’s intensity shall be adjustable to a minimum of 32 levels.
9. Minimum 4,096 levels of intensity for each color (red, blue, pure green) 14-bit processing.
10. 6,500-9,000 Kelvin color temperature. Color temperature shall remain constant across specified horizontal and vertical viewing angles.
11. Refresh rate shall be greater than 960+Hz.
12. Video frame rate at or greater than 60 frames per second.
13. Service accessibility for all components of the displays shall be from the front.
14. Pixel to Pixel Variation
   a. 95% or more of pixels within each module must have a luminance within +/- 4% of the mean luminance for the module.
   b. The average luminance of a column or row of pixels at the edge of a module or panel must be within +/- 2% of the average luminance of the module or panel.
   c. 95% or more of the pixels within each module must have a chromaticity value, Δu’v’, within +/- 0.006 of the mean chromaticity value for the module.
15. Module to Module Variation
   a. 100% of the modules in a screen must have a luminance within +/- 4% of the mean luminance for the screen.
   b. 100% of the adjacent modules (i.e., modules sharing a border) in a screen must have a luminance within +/- 3% of each other.
   c. 100% of the modules in a screen must have a chromaticity value, Δu’v’, within +/- 0.006 of the mean chromaticity value for the screen.
   d. 100% of the adjacent modules in a screen must have a chromaticity value, Δu’v’, within +/- 0.003 of each other.
16. All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles and are to be met for an all-White, all Red, all Green, and all blue screen display.
17. All listed specifications must be maintained throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.

18. Minimum of a 140 (70) horizontal viewing angle. Defined at 50% of full intensity, with automatic color-correction “on”, at stated angle maximum.

19. Minimum of a 140 (70) vertical viewing angle. Defined at 50% of full intensity, with automatic color-correction “on”, at stated angle maximum.

B. (AA-01) – Increase Resolution Center Hung LED Video Displays

1. Pixel Resolution: 6mm physical pixel resolution.
3. Minimum Resolution: 720 x 1280 based on maximum pixel pitch of 6mm.

C. Mullins Center – End Zone LED Video Displays

1. Quantity: Two (2) Indoor Video Display
2. Pixel Resolution: 16mm physical pixel resolution.
3. LED Supplier: Only Nichia or Cree LED’s will be accepted.
4. Minimum Active Area of Displays: 15.95’ tall by 52.9’ wide.
5. Minimum Resolution: 304 x 1008 based on maximum pixel pitch of 16mm.
6. Minimum Brightness: 2000nits (100% white with automatic color-correction “on”) at startup.
7. System must maintain a minimum brightness level of 1500nits throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.
8. Display’s intensity shall be adjustable to a minimum of 32 levels.
9. Minimum 4,096 levels of intensity for each color (red, blue, pure green) 14-bit processing.
10. 6,500-9,000 Kelvin color temperature. Color temperature shall remain constant across specified horizontal and vertical viewing angles.
11. Refresh rate shall be greater than 960+Hz.
12. Video frame rate at or greater than 60 frames per second.
13. Service accessibility for all components of the displays shall be from the front.
14. Pixel to Pixel Variation
   a. 95% or more of pixels within each module must have a luminance within +/- 4% of the mean luminance for the module.
   b. The average luminance of a column or row of pixels at the edge of a module or panel must be within +/- 2% of the average luminance of the module or panel.
   c. 95% or more of the pixels within each module must have a chromaticity value, \( \Delta u'v' \), within +/- 0.006 of the mean chromaticity value for the module.
15. Module to Module Variation
   a. 100% of the modules in a screen must have a luminance within +/- 4% of the mean luminance for the screen.
   b. 100% of the adjacent modules (i.e., modules sharing a border) in a screen must have a luminance within +/- 3% of each other.
c. 100% of the modules in a screen must have a chromaticity value, $\Delta u'v'$, within +/- 0.006 of the mean chromaticity value for the screen.

d. 100% of the adjacent modules in a screen must have a chromaticity value, $\Delta u'v'$, within +/- 0.003 of each other.

16. All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles and are to be met for an all-White, all Red, all Green, and all blue screen display.

17. All listed specifications must be maintained throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.

18. Minimum of a 140 (70) horizontal viewing angle. Defined at 50% of full intensity, with automatic color-correction “on”, at stated angle maximum.

19. Minimum of a 140 (70) vertical viewing angle. Defined at 50% of full intensity, with automatic color-correction “on”, at stated angle maximum.

D. (AA-02) – Increase Resolution End Zone LED Video Display

1. Pixel Resolution: 10mm physical pixel resolution.

2. Minimum Active Area of Displays: 15.74’ tall by 52.49’ wide.

3. Minimum Resolution: 480 x 1600 based on maximum pixel pitch of 10mm.

E. Mullins Center – Processing and Controls

1. Video screen control system must provide the ability to manage: brightness (multi-level), video input, and image position: size and scale, adjustable gamma correction, remote power function (power on/off), color, color temperature, contrast and sharpness.

2. Processing to allow for electronic color and brightness calibration - block to block and pixel to pixel.

3. The processor shall support the following inputs: HD-SDI video in either 720p or 1080i, SD-SDI (480p) and SDI 16x9 anamorphic signal, and DVI video.

4. All processing is to be located in video control room.

5. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the video display from a location outside of the display housing.

6. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

F. Mullins Center – Operating System

1. Contractor shall provide a fully functional operating system capable of production, CG and game operations

2. The system must have the ability to support DVE moves, enabling dynamic switching between full screen and vectored views with areas for sponsor ads, statistics, social media, closed caption and game in progress data for the scoring system.

3. The system must provide ability to display still and animated overlays, crawl text, and manipulate graphics

4. The system must be capable of accepting and displaying a serial feed from the scoring system and any and all 3rd party stats, social media, closed caption and sport ticker feeds as required.

5. Operating system is to be located in the production equipment room
6. Contractor shall provide a remote user station in the production room, with equipment located in the AV room.

7. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the video display from a location outside of the display housing.

8. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

G. (AA-03) Garber Field – LED Video Displays
1. Quantity: One (1) Outdoor Video Display
2. Pixel Resolution: 16mm physical pixel resolution.
3. LED Supplier: Only Nichia or Cree LED’s will be accepted.
4. Minimum Active Area of Displays: 15.1’ tall by 32.75’ wide.
5. Minimum Resolution: 288 x 624 based on maximum pixel pitch of 16mm.
6. Minimum Brightness: 6500nits (100% white with automatic color-correction “on”) at startup.
7. System must maintain a minimum brightness level of 6000nits throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.
8. Display’s intensity shall be adjustable to a minimum of 32 levels.
9. Minimum 4,096 levels of intensity for each color (red, blue, pure green) 14-bit processing.
10. 6,500-9,000 Kelvin color temperature. Color temperature shall remain constant across specified horizontal and vertical viewing angles.
11. Refresh rate shall be greater than 960+Hz.
12. Video frame rate at or greater than 60 frames per second.
13. Service accessibility for all components of the displays shall be from the front and rear.
14. Pixel to Pixel Variation
   a. 95% or more of pixels within each module must have a luminance within +/- 4% of the mean luminance for the module.
   b. The average luminance of a column or row of pixels at the edge of a module or panel must be within +/- 2% of the average luminance of the module or panel.
   c. 95% or more of the pixels within each module must have a chromaticity value, Δu’v’, within +/- 0.006 of the mean chromaticity value for the module.
15. Module to Module Variation
   a. 100% of the modules in a screen must have a luminance within +/- 4% of the mean luminance for the screen.
   b. 100% of the adjacent modules (i.e., modules sharing a border) in a screen must have a luminance within +/- 3% of each other.
   c. 100% of the modules in a screen must have a chromaticity value, Δu’v’, within +/- 0.006 of the mean chromaticity value for the screen.
   d. 100% of the adjacent modules in a screen must have a chromaticity value, Δu’v’, within +/- 0.003 of each other.
16. All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles and are to be met for an all-White, all Red, all Green, and all blue screen display.

17. All listed specifications must be maintained throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.

18. Minimum of a 140 (70) horizontal viewing angle. Defined at 50% of full intensity, with automatic color-correction “on”, at stated angle maximum.

19. Minimum of a 140 (70) vertical viewing angle. Defined at 50% of full intensity, with automatic color-correction “on”, at stated angle maximum.

H. (AA-03) Garber Field – Processing and Controls

1. Video screen control system must provide the ability to manage: brightness (multi-level), video input, and image position: size and scale, adjustable gamma correction, remote power function (power on/off), color, color temperature, contrast and sharpness.

2. Processing to allow for electronic color and brightness calibration - block to block and pixel to pixel.

3. The processor shall support the following inputs: HD-SDI video in either 720p or 1080i, SD-SDI (480p) and SDI 16x9 anamorphic signal, and DVI video.

4. All processing is to be located in video control room.

5. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the video display from a location outside of the display housing.

6. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

I. (AA-03) Garber Field – Operating System

1. Contractor shall provide a fully functional operating system capable of production, CG and game operations

2. The system must have the ability to support DVE moves, enabling dynamic switching between full screen and vectored views with areas for sponsor ads, statistics, social media, closed caption and game in progress data for the scoring system.

3. The system must provide ability to display still and animated overlays, crawl text, and manipulate graphics

4. The system must be capable of accepting and displaying a serial feed from the scoring system and any and all 3rd party stats, social media, closed caption and sport ticker feeds as required.

5. Operating system is to be located in the scoreboard operation building

6. Contractor shall provide a remote user station in the production room, with equipment located in the AV room.

7. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the video display from a location outside of the display housing.

8. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

J. LED Animation Package
1. Provide 20 custom animations with a minimum of 50% 3-D animations for each of the LED displays.

K. Acceptable LED Manufacturer
   1. Daktronics
   2. Samsung
   3. Light House
   4. Mitsubishi Diamond Vision Systems

2.2 SIGNAGE AND ASTHETICS

A. Mullins Center – Center Hung Displays
   1. Provide and install “MULLINS CENTER” channel cut venue ID Lettering (detailed specifications noted in rendering package).
   2. Provide and install “UMASS” channel logo (detailed specifications noted in rendering package).

B. Mullins Center – End Zone Displays (south display only)
   1. Provide and install “MULLINS CENTER” illuminated channel cut venue ID lettering (detailed specifications noted in rendering package).
   2. Provide and install “UMASS” illuminated channel logo (detailed specifications noted in rendering package).

C. (AA-03) Garber Field – LED Displays
   1. Provide and install “RICHARED e. GARBER FIELD” illuminated channel cut venue ID lettering (detailed specifications noted in rendering package).
   2. Provide and install “UMASS” illuminated channel logo (detailed specifications noted in rendering package).

2.3 SCORING SYSTEM

A. Provide and install the following equipment:
   1. Shot clocks for each goal plus one spare set (total of 3). Shot clocks shall be NBA style double sided transparent (see thru) style clocks and shall display game time and shot time. A set shall include two shot clocks on each goal. Large clock mounted parallel above the backboard glass shall be a maximum of 32.4” high by 31.7” wide by 4” deep and shall have 13” tall red LED’s for shot clock and 7” yellow LED’s for game time. Small clock mounted on the backstop structure perpendicular to the backboard glass shall be a maximum of 22” high by 22” wide by 3.5” deep and shall have 7” tall red LED’s for shot clock and 5” yellow LED’s for game time. Both clocks shall include red LED strips around the perimeter that shall illuminate when time has expired. Clocks shall have camera mounting brackets.
   2. New shot clock brackets for existing goals. Brackets for large shot clock shall be “fold down” style to permit storage of goals in existing location used by Owner.
   3. Two sets plus one spare set of red LED light strips around the perimeter of each backboard glass.
   4. One set plus one spare set of possession indicators to be installed on Courtside tables.
   5. One portable basketball scoreboard with score and game clock.
6. Total of eight (8) Locker Room Clocks – minimum 4-inch-tall red fixed LED digits with a maximum overall cabinet size of 1'-8" wide by 9" tall by 4" deep.

7. Two (2) horns to be installed on center-hung.

8. Two (2) Basketball Scoreboard Controllers (1 primary and 1 backup).

9. Truck bay clock and broadcast truck data panel connection.

10. Two (2) Data Distribution Panels (1 large and 1 small)

2.4 CENTER HUNG HOIST

A. Standard underhung mounted, single drum hoist with two pick points and a capacity of 20,000 lbs. Hoist must have the ability for soft start and stop

B. Hoist power requirements is 10Hp at 480V. Full load Amps is 30 Amps x 1.25 = 17.5 Amps and will require a 30 Amp feeder at hoist to be provided by the Contractor. Owner will provide primary 30 Amp 480V power at catwalk location. Contractor to provide any secondary distribution for hoist if needed.

C. Control for hoist will be from the catwalk and also include a wireless remote. Control position must allow operator to stand and view the center hung video board along with hoist operation when in use.

2.5 (AA-03) AUDIO – GARBER FIELD

A. (1) Network Switch – HP 253024G or similar.

B. (1) CD/Media Player – Denon DN 700C or similar.

C. (1) Digital Mixing Console – Yamaha O1V96i or similar.

D. (2) Monitor Speakers – Yamaha MSP3 or similar.

E. (1) Single Sided Headset Mic – Beyerdynamic DT 287 PV MKII or similar.

F. (1) Announcer Box – Whirlwind THS 2 or similar.

G. (1) Uninterruptable Power Supply – Middle Atlantic 2200R-IP or similar.

H. (2) Type 1 Loudspeaker – Danley Sound Labs SH96HOI-XAT or similar.

   1. Acceptable manufacturers:
      a. Danley Sound Labs
      b. JBL
      c. Community

I. (1) Type 1 Amplifier – Danley Sound Labs DNA-20K4PRO or similar.

   1. Acceptable manufacturers:
      a. Danley Sound Labs
      b. Crown
      c. QSC
J. (1) Uninterruptible Power Supply – Middle Atlantic 2200R-IP or similar.

2.6 (AA-03) AUDIO VISUAL

A. Head End
   1. (6) QMOD Modulators
   2. (1) BT OC-8 Combiner
   3. (1) BT FIBT-10-1550-SA SMTX
   4. (1) BT FOC-108U-SA 1x8 Optical Splitter
   5. (10) BT FRDA-S4A-860-SA RX AMP

END OF PART 2 PRODUCTS
PART 3 EXECUTION

3.1 LED DISPLAYS

A. Scope of Work

1. The following outlines the turnkey delivery and installation responsibilities that define the project scope of work. Any and all work outlined in this section is the responsibility of the Contractor unless otherwise noted. Any and all dates referenced in this document are approximate projected dates and are subject to change.

2. Contractor is required to provide all labor, materials, tools, supervision and equipment to perform the following:

3. Remove and dispose of all existing equipment that is being replaced in this package, including an existing batten system located within the catwalk of the arena.
   a. Provide and install all equipment and displays listed in Part 2 – Products, including any and all equipment not specifically listed that is required to provide a completely functional system.
   b. Contractor to provide all necessary protection for all facility components, including event floor. Contractor is responsible for repair or replacement of any damaged facility components caused by the Contractor and/or any subcontractors hired by Contractor to perform work on site.
   c. Provide and install hoist, LED displays, signage and aesthetics as depicted and specified in rendering package. Primary structures for the End Zone Video Displays and Garber field are provided as currently exist. Secondary steel shall be designed and engineered by Contractor. Contractor shall also be responsible for design of final attachments for new LED displays and signage elements. Contractor shall provide final structural drawings per Section 3.2.
   d. New center hung LED display will be supported by a new hoist provided by the Contractor. Contractor to provide and install center hung LED Video Screens, signage and aesthetics as depicted and specified in render package. New center hung structure shall be engineered, supplied and installed by Contractor. Center hung structure shall have final look and aesthetics as shown in the AJP rendering package. Contractor shall provide final structural drawings per Section 3.2.
   e. Power for all displays will be provided in a proximate location to each display. A disconnect shall be considered the electrical demarcation point. Contractor shall be responsible for all electrical work from this point as required to accommodate all display equipment provided by Contractor. Contractor shall provide final electrical drawings.
   f. If primary power is not sufficient, then Contractor is responsible for bringing additional power to scoreboard structures from new demarcation points.
   g. Provide all required signal cable in provided conduit. Provide required electrical and data cable: connect all equipment with power, signal and control wiring.
   h. Coordinate placement of new equipment rack(s) and electrical components.
   i. Provide all required permits and licenses.
   j. Provide on-site installation supervisor.
   k. Deliver all Equipment to site and convey to appropriate locations within site as directed by the project.

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Construction Documents
I. Store all Equipment in a safe and secure manner until installed, or otherwise directed by the project.

B. Engineering

1. The Contractor shall submit drawings and calculations stamped by a professional engineer who shall be licensed/registered in the State of Massachusetts.

2. Contractor is responsible for taking all seismic and environmental considerations into account and making structural provisions for any such requirements.

3. All drawings must be approved in writing prior to the fabrication and installation of any equipment.

4. Engineered drawings are to include both structural and electrical.

5. The Contractor is solely responsible for verification the integrity of all engineering calculations. Contractor is responsible for verification of all information provided or implied.

C. Structural Considerations

1. Contractor is responsible to design, engineer, build, deliver, install, integrate and commission complete turnkey displays as specified with all required sub-structure needed to support all display components.

2. Flashing and any other related equipment shall be the responsibility of the Contractor to furnish and install.

3. Contractor is responsible for design and erection of all materials related to the new equipment.

4. Structure is to be fabricated using structural steel and/or aluminum (optional). Flooring or catwalks shall be steel or aluminum grating or grip strut. Plywood is not acceptable for flooring or catwalks. Contractor shall provide necessary protective separation when connecting dissimilar metals to prevent galvanic corrosion.

5. Bolted and/or field welded connections shall be subject to special inspection by an independent testing & inspection agency certifying that bolted and/or welded connections meet the minimum requirements of the engineered structural drawings, the governing building code, or as required by the building official; whichever is more restrictive. Inspections shall take place prior to painting any connection.

6. Documentation shall be provided verifying acceptable results from all special inspections. All items failing inspection shall be repaired or replaced and re-inspected at no additional cost.

7. All components to be painted and otherwise finished for exterior service conditions shall be warranted to be free of rust or other defects for a period of ten years.

8. All welders must be certified and certificates must be on site and available for inspection as requested.

9. To minimize fading or oxidation, all finishes must be primed and coated. All areas of the primary and secondary support structure must be primed and painted to match.

D. Electrical and Data

1. The electrical design and installation of all branch circuits by the Contractor shall comply with NEC, state and local codes.

2. Contractor shall provide remote power on/off as noted in Part 2 Products. Contractor shall provide sufficient number of switches to control all displays, specialty lighting and
signage elements. Switches to be mounted into equipment racks along with other equipment provided by Contractor. Configuration of switches shall be submitted with shop drawings to be approved by Owner.

3. The Contractor shall provide electrical and data one-line diagrams.

4. Electrical design and engineering must be reviewed and prior to any electrical work by the Contractor.

5. The Contractor will be responsible for power distribution from the demarcation points noted in Section 3.1.B.6. Any additional electrical components required for a complete and fully operational system but not shown on the electrical drawings shall be the responsibility of the Contractor.

6. Any additional raceway (conduit, cable tray, J hooks) required to provide a complete system for both power and signal/data shall be furnished and installed by Contractor. Any additional raceway required shall have routing of raceway approved prior to installation.

7. The Contractor shall be responsible for termination and final connect of power to all elements. All secondary electrical panels must be clearly marked with names of the branch circuits controlled by each breaker to aid in troubleshooting or isolating problems. All electrical services, disconnects, and breaker panels are to be labeled with what they control and where they are fed from.

8. Contractor shall not use wire nuts or electrical tape for any power or signal connection or any part of the work including internal LED display power jumpers or power connections to signage elements. All connections shall use a proper terminal block and spade terminal or terminal block and direct connection as required. Covers shall be provided over all high power terminal blocks to prevent electrical shock.

9. Permanent power distribution from provided primary power source shall use rigid metal conduit and wire or metal clad (MC) cable. The use of SO cord or rubber jacket type power cables typically used on transportable installations or used on the installation of pitch side displays shall not be permitted for permanent installations. Strain relief on all connections shall be per manufacturer’s recommendations. Contractor shall submit manufacturers strain relief recommendations for all connectors during the submittal process.

10. The Contractor will be responsible for providing stamped electrical drawings. A licensed/registered engineer in the State of Massachusetts where this project is located shall stamp all electrical drawings.

11. Any equipment not certified as required in Section 1.4.A. shall require on site certification by a listed testing agency. All cost associated with obtaining on site certification shall be the responsibility of the Contractor. Written proof of certification or equivalent will be required prior to any work being performed on site.

12. Contractor shall provide six (6) spare strands of fiber in addition to the total amount of fiber that is required to provide video signal and/or data communication to LED displays installed by Contractor. All fiber shall be terminated and landed in an appropriate fiber patch panel. All new fiber supplied by Contractor shall be tested and shall not exceed maximum allowable dB loss per Section 3.4.M and/or Section 3.4.N.

13. Multi-mode fiber tested shall not have a signal dB loss greater than 0.1dB per 100 feet (30m) for 850nm fiber or a loss greater than 0.1 dB per 300 feet (100m) for 1300nm fiber.

14. Single-mode fiber tested shall not have a signal dB loss greater than 0.1dB per 600 feet (200m) for 1310nm fiber or a loss greater than 0.1 dB per 750 feet (250m) for 1550nm fiber.
15. Contractor to provide all required fiber transmitters and receivers (including amplifiers where required). Contractor will be responsible to terminate and perform final connection of all cables. Cables will be routed from the specified control locations to the display components per Contractor’s diagram.

E. Aesthetic Considerations

1. Contractor shall assume premium finishes on all elements not yet defined.

2. Prior to contract award, the Contractor shall provide a comprehensive outline of all intended flashing and finish details for approval. Failure to submit these details prior to contract award shall make Contractor responsible for all flashing and finishes as required at no additional cost.

3. No exposed bolts, inverted U channels, or unfinished edges on LED displays or signage elements shall be permitted on any surface with public view. Any part of the secondary steel frame exposed to public view shall be covered with flashing to match the edge of the LED display.

4. Unless specified differently on the AJP Drawings, the following shall serve as a minimum standard for products and finishes. Contractor shall be responsible to ensure that the material thickness provided is sufficient to prevent warping or “oil canning” on the span or sections of material installed.

   a. Metals
      1) + .040” aluminum on internal baffling
      2) + .090” aluminum on flashing
      3) + .125” aluminum on any routed or primary surface
      4) + 12ga/2.6mm stainless steel (visible)

   b. Plastics
      1) + .117” thickness on thermoformed polycarbonates
      2) + .177” thickness on flat polycarbonates
      3) + .125” thickness on flat acrylics

   c. Finishes
      1) + Approved Automotive Grade Enamels
      2) + ASTM D3451-06 compliant Powder Coating

   d. Vinyl Films
      1) + 3M, Avery, Oracal or other as approved.
      2) + 9oz weight for any outdoor banner (UV coated)

5. The Contractor shall not visibly display its trademarks or insignia on any of the Equipment or structural elements.

F. Training

1. The Contractor at its own expense will provide designated operator and maintenance training.

2. Training will be performed at the site by a qualified technician and shall occur immediately following substantial completion. O&M Manuals per Section 1.3.B shall be provided prior to training.
3. The training shall cover the operation, routine maintenance and troubleshooting of the displays and control equipment.

4. Training shall consist of at least 24 hours (over the course of 3-5 days) of instruction.

5. Contractor will be required to have a control systems operator and LED technician on site for the first event and continue to be on site for three (3) consecutive problem free events. “Problem-free” constitutes an event where the video and scoring displays, control system, and any other components installed by the Contractor are without failure during an event. Each successful event will need to be signed off until three (3) consecutive events are achieved.

6. Warranty period will commence at conclusion of the third consecutive successful event.

G. Testing and Acceptance

1. Contractor must demonstrate the full capabilities of the provided systems and prove performance meets contractual specifications.

2. Confirmation will be required of, but not limited to the following functions: operation of each system component, including back-up systems, control functionality, integration with existing systems, diagnostic capabilities, screen brightness, color temperature and viewing angles.

3. Contractor must provide all necessary testing equipment for acceptance.

4. Upon notice from the Contractor of substantial completion and at a time to be mutually agreed upon, the Contractor will arrange for the testing of all operations of the systems comprised in scope of work at the time of substantial completion.

5. The following items must be completed and signed off by an appropriate official before the system is “Accepted”:

   a. LED Screens - Brightness and color uniformity shall be demonstrated and must meet the specification described. If the demonstration exhibits the display in noncompliance with the specifications, it will be the responsibility of the Contractor to make the necessary adjustments or to adjust, repair or replace the components necessary to meet the specifications. The Project will not be responsible for any added costs as a result of an unsuccessful acceptance test.

   b. Certain LED video displays included in this bid package are required to maintain minimum parameters over a specified period of time. The project at its sole discretion may engage an independent testing agency to verify the display’s specifications, at any time during the specified period of time. Cost for this testing will borne by the project, if display is in compliance. If the testing exhibits the display in noncompliance with the specifications, the cost of the testing will be the responsibility of the Contractor. Contractor will also be responsible to make the necessary adjustments or repair or replace the components necessary to meet the specifications. The project will not be responsible for any added costs as a result of an unsuccessful test.

   c. Functionality of each of the displays and their control systems, as specified, shall be demonstrated in its entirety.

   d. Acceptance of the system includes, but not limited to, the completed installation of all physical components and the issuance of the Certificate of Approval for code compliance by the Code Authority having Jurisdiction. Tests of the system shall not occur until after the system has been installed, and all work completed on the display systems.

6. Document all acceptance testing, calibration and correction procedures described herein. Include the following information:
a. Performance date of the given procedure.
c. Type of procedure, and description.
d. Parameters measured and their values, including values measured prior to calibration or correction, as applicable.
e. The names of personnel conducting the procedure.
f. The equipment used to conduct the procedure.

7. Upon completion of initial tests and adjustments, submit written report of tests along with all documents, diagrams, and recorded drawings required herein.

   a. Perform any and all “punch-list” work to correct inadequate performance or unacceptable conditions at no additional expense.
   b. Furnish all portable (includes spare parts) equipment along with complete inventory documentation. All portable equipment shall be presented in the original manufacturers packing, complete with all included instructions, miscellaneous manuals, and additional documents.
   c. Provide new acceptance testing in the same format as initial test reports.
   d. Check, inspect, and if necessary, adjust all systems, equipment, devices and components specified approximately thirty (30) days after acceptance.
   e. Upon completion of the Work, the Project may elect to verify test data as part of acceptance procedure. Provide personnel and equipment to reasonably demonstrate system performance and to assist with such tests without additional cost.

3.2 AUDIO – GARBER FIELD

A. SCOPE OF WORK

1. The following outlines the turnkey delivery and installation responsibilities that define the project scope of work. Any and all work outlined in this section is the responsibility of the Contractor unless otherwise noted. Contractor is required to provide all labor, materials, tools, supervision and equipment to perform the following:
   a. Mount loudspeakers on LED structure.
   b. Install amplifier in rack in control room.
   c. Program amplifier with appropriate DSP module settings for specified loudspeakers.
   d. Install and configure additional specified equipment at Owner determined mix position.
   e. Contractor shall be responsible for assembly, secondary modifications and mounting of all audio components onto new or existing structures.
   f. Provide and install all equipment listed in Part 2.4 – Products, including any and all equipment not specifically listed but part of this bid that is required to provide a completely functional system.
   g. Provide required signal and data cable. Connect all equipment with power, signal and control wiring from electrical outlets currently existing or to be provided.
   h. Coordinate with Owner regarding placement of new equipment rack(s) if necessary and placement of electrical components.
i. Coordinate with Owner regarding functionality expected with audio DSP system and provide programming.

j. Provide all required permits and licenses.

k. Provide on-site installation supervisor per Section 1.5.E.

l. Coordinate work with other trades and coordinate scheduling with the construction supervisor to minimize delays.

m. Deliver all Equipment to site and convey to appropriate locations within site as directed by Owner.

n. Store all Equipment in a safe and secure manner until installed, or otherwise directed by Owner. Coordinate onsite storage container or available space in facility.

**B. GROUNDING AND SHEILDING**

1. Mount and enclose all electrical and electronic equipment in metal enclosures, pedestals or equipment racks.

2. Use EMT type conduit for all wiring outside of equipment racks except plenum rated wiring above a lay-in ceiling, and outdoor conduits and raceways, where separate insulated ground wiring shall be supplied. Underground raceways to be of rigid type.

3. Use flexible conduits and PVC fittings to provide insulated connections of the building electrical raceways to equipment racks. Mount all equipment racks at the job site in a manner which provides electrical isolation from the building structure and electrical raceways.

**C. WIRING PRACTICES/INSTALLATION**

1. Provide weather rated cable for work to meet NEC codes. Use Belden B9C042T fiber optic series cable rated for indoor/outdoor use. Use Belden indoor/outdoor rated cabling for sound system components as recommended by Manufacturer to include Belden 8471, Belden 9451(WB), Belden 2412 and Belden 1816R (WB) as required.

2. Provide wet rated electrical power cords that connect to the nearest electrical outlet provided by others if environmental conditions require. Appropriate AC power connections are to be field verified.

3. Provide Belden 9451WB or 1816WB cabling between for signal connection. These cables are to be bundled, supported and professionally installed. Provide service and drip loops.

4. In all instances applicable, use Neutrik, Switchcraft, or other signal connectors that are gold plated. Use Hubbell or equivalent electrical connectors for power. Use Belden or Corning fiber connectors using primary ST and for equipment that requires it use LC terminations. Install a ground buss bar in the environmental rack and connect to a technical ground provided by the project electrical contractor at equipment rack.

5. Where specific instructions are not given, perform all wiring in strict adherence to standard audio engineering practices in accordance with the references listed in Section 1.5.

6. Group all wiring into the following classifications by power level or signal type:
   a. Microphone Level: less than -20dBm.
   b. Line Level Audio and DC Control Circuits: -20dBm.
   c. Speaker Level; greater than +30dBm.
   d. Copper Data.
e. Fiber Data.

f. AC Power Circuits.

7. Separate wiring of differing classifications by at least six (6) inches, wherever possible. Wherever lines of differing classification must come closer together than six (6) inches, cross them perpendicular to each other.

8. Neatly harness wires together within racks by power level classification using horizontal and vertical wiring supports as required. Rigidly support all wires with fixed connection points. Leave service loops of sufficient lengths to allow rack hinges or slides to fully extend to facilitate access to rear panel connectors from the front of each rack. Do not use self-adhesive ty-wrap pads for support of cables unless fastened with screws.

9. Observe consistent polarity throughout the audio systems as follows:
   a. Use only balanced differential inputs throughout the audio system.
   b. Use approved transformers where directed to reduce objectionable system noise to acceptable levels.

10. Exercise care in wiring to avoid damaging the cables and equipment. Use grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.

11. Cut off unused wire ends approximately one-half inch (1/2”) past the wire jacket. Fold them back over the jacket, and secure in place with heat-shrink tubing. In multi-conductor cables, preserve all unused conductors for future use. Failure to do so may result in replacement of cables at the contractor’s expense.

12. Make connections using rosin-core solder or approved mechanical connectors. Connect microphone, control, and line level wiring through approved connectors. Connect speaker level wiring using approved terminal barrier strips. Mount all terminal devices on a non-conductive (electrically) rigid surface. Provide 10% spare terminals at each location. Label each terminal with a unique number.

13. All fiber splicing shall utilize the fusion splice method. The maximum allowable loss for fusion splice shall be .5 dB.

14. Pull mandrel one size smaller than the conduit, through entire length of all underground conduits.

15. Cable pulling lubrication shall be utilized when pulling cable in conduits.

16. A dynamometer shall be used to measure pulling tension during long or difficult runs. The dynamometer is to be placed between the cable puller and the pull line to monitor pulling tension. The manufacturer’s pulling tension maximum range shall not be exceeded.

17. Pulling grips suitable for use with fiber cables shall be applied to the ends of the cable. Consult cable manufacturer to determine appropriate pulling grip and method of attachment. Breakaway or fuse links shall be used at the pulling grip. Insure that the correct fuse pin is installed in the fuse link.

18. The bend radius for all cables shall conform to manufacturer’s specifications.

D. LABELING

1. Label products in a logical, legible, and permanent manner corresponding to the Drawings. Wording, format, style, color and arrangement of text will be subject to the Architect’s approval. Submit samples and labeling schedule for approval. Labeling will be verified at final adjustment and equalization.
2. Label all wall plates for input, output, and control receptacles as well as connector mounting plates in all boxes using 1/8” engraved lettering filled with black or contrasting paint, as approved.

3. Use engraved plastic labels similar to Lamicoid, squarely and permanently attached, to label the following:
   a. Patch panel designation strips.
   b. Front and back of all rack mounted equipment including controls.
   c. Barrier strips, terminals, transformers, switches, relays, volume controls and similar devices.

4. Label pushbutton switches with engraved lettering filled with contrasting color paint.

5. Label all permanently installed wires on both ends with approved permanent clip-on type or sleeve type markers. Wrap-around adhesive labels will not be accepted unless completely covered with clear heat shrink tubing.

6. Label all portable equipment with engraved block letters using initials and/or words. Label all portable cables similarly with printed heat-shrinkable tags located 12 inches from the male connector end. Verify lettering through the Architect prior to engraving or printing.

7. Label access panels and backboards with designations corresponding to the drawings. Where devices are concealed above access ceilings, provide permanent lamicoid labels, on the ceiling « tees », corresponding to the drawings in finishes and sizes approved by the Architect.

E. ENGINEERING

1. Contractor is to provide stamped engineered drawings of all loudspeaker mounting locations. Engineer is to be certified in the state of Massachusetts.

2. Owner must approve all drawings in writing prior to the fabrication and installation of any equipment.

3. Engineered drawings are to include both structural and electrical.

4. The Contractor is solely responsible for verification the integrity of all engineering calculations. Contractor is responsible for verification of all information provided or implied.

F. STRUCTURAL CONSIDERATIONS

1. Contractor is responsible to design, engineer, build, deliver, install, integrate and commission complete turnkey sound reinforcement system as specified with all required sub-structure needed to support all speaker components.

2. Install all loudspeakers using the best industry practices and as recommended by the Manufacturer. The speakers and their accessories and required rigging materials shall be stainless steel or weather-rated as appropriate. Contractor shall verify all field conditions and coordination prior to installation.

3. Mount loudspeakers, processors, fiber interfaces, UPS, and other required devices to make for a complete operating system.

4. Contractor is responsible for design and erection of all mounting equipment/materials/hardware related to the new equipment.
5. Mounting equipment/materials/hardware is to be fabricated using structural steel and/or aluminum (optional). Contractor shall provide necessary protective separation when connecting dissimilar metals to prevent galvanic corrosion.

6. Bolted and/or field welded connections shall be subject to special inspection by an independent testing & inspection agency certifying that bolted and/or welded connections meet the minimum requirements of the engineered structural drawings, the governing building code, or as required by the building official; whichever is more restrictive. Inspections shall take place prior to painting any connection.

7. Documentation shall be provided to Owner verifying acceptable results from all special inspections. All items failing inspection shall be repaired or replaced and re-inspected at no additional cost to the Owner.

8. All components to be painted and otherwise finished for exterior service conditions shall be warranted to be free of rust or other defects for a period of ten years.

9. All welders must be certified and certificates must be on site and available for inspection as requested.

10. To minimize fading or oxidation, all finishes must be primed and coated. All areas of the secondary support structure must be primed and painted to match.

G. ELECTRICAL AND DATA

1. The electrical design and installation of all branch circuits by the Contractor shall comply with NEC, state and local codes, as well as Owner regulations and guidelines.

2. The Contractor shall provide signal and data one-line diagrams.

3. Contractor shall provide six (6) spare strands of fiber in addition to the total amount of fiber that is required to provide audio signal and/or data communication all audio components installed by Contractor. All fiber shall be terminated and landed in an appropriate fiber patch panel. All new fiber supplied by Contractor shall be tested and shall not exceed maximum allowable dB loss per Section 3.6.K and/or Section 3.6.L.

4. Multi-mode fiber tested shall not have a signal dB loss greater than 0.1dB per 100 feet (30m) for 850nm fiber or a loss greater than 0.1 dB per 300 feet (100m) for 1300nm fiber.

5. Single-mode fiber tested shall not have a signal dB loss greater than 0.1dB per 600 feet (200m) for 1310nm fiber or a loss greater than 0.1 dB per 750 feet (250m) for 1550nm fiber.

6. Contractor to provide all required fiber transmitters and receivers (including amplifiers where required). Contractor will be responsible to terminate and perform final connection of all cables. Cables will be routed from the specified control locations to the audio components per Contractor’s diagram once diagram has been approved by the Owner.

H. AESTHETIC CONSIDERATIONS

1. Contractor shall assume premium finishes on all elements not yet defined.

2. Prior to contract award, the Contractor must provide a comprehensive outline of intended finish details of all audio equipment that is to be located in public viewing areas for Owner approval. Failure to submit these details prior to contract award shall make Contractor responsible for all finishes as required by Owner at no additional cost to Owner.

3. No exposed bolts or unfinished surfaces are permitted on audio equipment that is within public view. Any part of the secondary steel frame exposed to public view shall be covered with flashing or structure if so requested by Owner.

4. The Contractor shall not visibly display its trademarks or insignia on any of the Equipment or structural elements within public view.
I. FINAL ADJUSTMENT AND EQUALIZATION

1. Ensure that the system is free from oscillation, noise, hiss, buzzes, or other extraneous noises. Coordinate with Scoreboard contractor to identify structure rattles so they may be eliminated during testing phase.

2. Schedule a time for the Owner to perform the Final Adjustment and Equalization. Notify the Owner at least seven (7) days in advance.

3. Furnish a technician who is familiar with the system to assist the Architect during the Final Adjustment and Equalization.

4. Record final settings on all equipment and submit with contract closeout documents.

J. TRAINING

1. The Contractor, at its own expense, will provide designated Owner employees’ operator and maintenance training.

2. Training will be performed at the site by a qualified technician and shall occur either during installation of the equipment or immediately thereafter. O&M Manuals per Section 1.3.B shall be provided to Owner prior to training.

3. The training shall cover the operation, routine maintenance and troubleshooting of the sound system and control equipment.

4. Training shall consist of at least 12 hours (over the course of 1-2 days) of instruction.

5. Contractor will video record all training sessions and submit recorded training sessions to Owner in DVD format with O&M Manuals.

6. Contractor will be required to have an audio systems operator on site for the first event and continue to be on site for three (3) consecutive problem free events. “Problem-free” constitutes an event where the sound system and any other components installed by the Contractor are without failure during an event. Each successful event will need to be signed off by the Owner until three (3) consecutive events are achieved.

7. Warranty period will commence at conclusion of the third consecutive successful event.

K. TESTING AND ACCEPTANCE

1. Contractor must demonstrate the full capabilities of the provided systems and prove performance meets contractual specifications.

2. Confirmation will be required of, but not limited to the following functions: operation of each system component, including back-up systems, control functionality, integration with existing systems.

3. Contractor must provide all necessary testing equipment for acceptance.

4. Upon notice from the Contractor of substantial completion and at a time to be mutually agreed upon, the Contractor will arrange for the testing of all operations of the systems comprised in scope of work at the time of substantial completion.

5. The following items must be completed and signed off by an appropriate Owner official before the Owner will deem the system “Accepted”:

   a. The Owner will not be responsible for any added costs as a result of an unsuccessful acceptance test.

   b. Acceptance of the system includes, but not limited to, the completed installation of all physical components and the issuance of the Certificate of Approval for code compliance by the Code Authority having Jurisdiction. Tests of the system shall not occur until after the system has been installed, and all work completed.
6. Document all acceptance testing, calibration and correction procedures described herein. Include the following information:
   a. Performance date of the given procedure.
   c. Type of procedure, and description.
   d. Parameters measured and their values, including values measured prior to calibration or correction, as applicable.
   e. The names of personnel conducting the procedure.
   f. The equipment used to conduct the procedure.

7. Upon completion of initial tests and adjustments, submit written report of tests to the Owner along with all documents, diagrams, and recorded drawings required herein.

   a. Perform any and all “punch-list” work to correct inadequate performance or unacceptable conditions, as determined by the Owner, at no additional expense to the Owner.
   b. Furnish all portable equipment to the Owner along with complete inventory documentation. All portable equipment shall be presented in the original manufacturers packing, complete with all included instructions, miscellaneous manuals, and additional documents.
   c. Provide new acceptance testing in the same format as initial test reports.
   d. Check, inspect, and if necessary, adjust all systems, equipment, devices and components specified, at the Owner’s convenience, approximately thirty (30) days after the Owners acceptance.
   e. Upon completion of the Work, the Owner may elect to verify test data as part of acceptance procedure. Provide personnel and equipment, at the convenience of the Owner, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Owner.

END OF PART 3 EXECUTION
SECTION 230500

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. Where conflicts occur between divisions, the more stringent requirement shall apply.

B. Related Sections:
   1. All sections within Division 23 – Heating, Ventilating, and Air Conditioning.
   2. All sections within Division 01 – General Requirements.
   3. Relevant sections within Division 02 – Concrete.
      a. Section 02 41 00 – Demolition
   4. Relevant sections within Division 05 – Metals.
      a. Section 05 12 00 – Structural Steel Framing.
   5. Relevant sections within Division 26 – Electrical.
      a. Section 26 05 19 – Low Voltage Cables.
      b. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
      c. Section 26 24 16 – Panelboards.

1.2 SUMMARY

A. The requirements of this section apply to all the Work of Division 23.

B. This Section Includes the following:
   1. Applicable codes.
   2. General project requirements.
   3. Concrete pads.
   5. Access panels.
   6. General installation requirements.
   7. General testing requirements.
   8. Piping materials and installation instructions common to most piping systems.
   10. Dielectric fittings.
   11. Mechanical sleeve seals.
   12. Sleeves.
   15. Equipment installation requirements common to equipment sections.
   16. Painting and finishing.
   17. Concrete bases.
   18. Supports and anchorages.
1.3 REFERENCES

A. References to standard codes, specification of regulatory agencies shall mean editions in effect at date of proposal. Reference to technical societies, trade organizations, and governmental agencies is made in this Division in accordance with the following abbreviations:

1. AABC Associated Air Balance Council
2. ADCD Air Diffusion Council - Test Code
3. AGA American Gas Standard
4. AMCA Air Moving and Conditioning Association
5. ANSI American National Standards Institute
6. ARI Air Conditioning and Refrigeration Institute
7. ASA American Standards Association
8. ASC Adhesive and Sealant Council
9. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
10. ASME American Society of Mechanical Engineers
11. ASSE American Society of Sanitary Engineering
12. ASTM American Society for Testing and Materials
13. AWS American Welding Society
14. AWWA American Water Works Association
15. CISPI Cast Iron Soil Pipe Institute
17. EPA Environmental Protection Agency
18. FMS Factory Mutual System General Industry Safety Orders, Article 3281
19. HEW US Dept. of Health, Education and Welfare
20. HI Hydraulic Institute
21. IAPMO International Association of Plumbing and Mechanical Officials
22. IBC International Building Code
23. IECC International Energy Conservation Code
24. IFC International Fire Code
25. IMC International Mechanical Code
26. IMSS Manufacturers’ Standardization Society
27. IPC International Plumbing Code
28. IRI Industrial Risk Insurers
29. LEED Leadership in Energy and Environmental Design
30. NBS National Bureau of Standards
31. NCWB National Certified Piping Welding Bureau
32. NEBB National Environmental Balance Bureau
33. NEC National Electrical Code
34. NEMA National Electrical Manufacturers' Association
35. NFPA National Fire Protection Association
36. NYCCC New York City Construction Code
37. NYSBC New York State Building Code
38. NYSECCC New York State Energy Conservation Construction Code
39. OSHA Occupational Safety and Health Administration
40. PDI Plumbing and Drainage Institute
41. SMACNAS Sheet Metal and Air Conditioning Contractors National Association
42. UBC Uniform Building Code
43. UL Underwriters Laboratories, Inc.
44. UMC Uniform Mechanical Code
45. **UPC**  Uniform Plumbing Code  
46. **USGBC**  United States Green Building Council

### 1.4 DEFINITIONS

A. **Finished Spaces:** Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. **Exposed, Interior Installations:** Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. **Exposed, Exterior Installations:** Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. **Concealed, Interior Installations:** Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. **Concealed, Exterior Installations:** Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. “Regulating Authorities” means all governmental, utility and fire protection authorities having jurisdiction.

G. “Provide” means to supply, erect, install and connect up completely, in readiness for regular operation, the particular work referred to.

H. “Furnish” means purchase, store and deliver the specified material, equipment or other item to the person or party indicated.

I. “Approved Equal” means any equipment or material which in the opinion of the architect, is equal in quality, durability, appearance, strength, design and performance to the equipment or material specified and will function adequately in accordance with the general design.

J. “Singular Number”: Where any device is herein referred to in the singular number, such reference shall be deemed to apply to as many such devices as are required to complete the installation or as many as are shown.

K. “Piping” as used in the drawings and specifications means all pipe, fittings, nipples, flanges, valves, unions, hangers and supports that are required for a complete functional system.

L. “Ductwork” as used in the drawings and specifications means all ductwork, fittings, dampers, air terminal devices, diffusers, registers, grilles, hangers and supports that are required for a complete functional system.

M. “Wiring” includes, in addition to conductors, all raceways, conduit, fittings, boxes, switches, hangers and other accessories related to such wiring.
N. “Contract Documents” or “Documents” shall mean the latest version of all drawings and specifications prepared by the Engineer and Architect.

O. “Authority Having Jurisdiction” or “AHJ” shall mean the building department, fire department, inspectorate or other authority having legal jurisdiction relevant to the specific work being described in the City or State where the project is located.

P. The following are industry abbreviations for plastic materials:
   1. CPVC: Chlorinated polyvinyl chloride plastic.
   2. PE: Polyethylene plastic.
   3. PVC: Polyvinyl chloride plastic.

Q. The following are industry abbreviations for rubber materials:
   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.5 REGULATIONS, CODES, PERMITS AND FEES

A. Before bidding, be familiar with rulings of inspection departments and comply with such requirement. Codes, standards and specifications applicable to this work shall be the latest editions in effect at the date of the proposal.

B. It is not the intent of Drawings and Specifications to repeat requirements of codes except where necessary for completeness or clarity.

C. All work and material shall be in full accordance with the latest rules and regulations of the following agencies:
   1. Safety Orders of the Division of Industrial Industry
   2. International Building Code
   3. International Mechanical Code
   4. International Plumbing Code
   7. Listing and approval of Underwriters’ Laboratories, Inc. where available and applicable.
   8. Listing and approval of American Gas Association where available and applicable.

D. Rulings and interpretations of authorities shall be considered a part of the regulations.

E. Where the standards of the drawings and specifications for materials and/or workmanship are higher than the requirements of the documents cited above, the drawings and specifications shall take precedence; otherwise the documents shall govern.

F. Nothing in these plans or specifications is to be construed to permit work not conforming to these codes and regulations.

G. Should there be any direct conflict between the above rules and the specifications, the rules shall govern.
H. Charges for all materials and labor required for compliance with these rules and regulations shall be included in the Bid Price.

I. Give necessary notices, obtain permits and pay taxes, fees and other costs in connection with work; file necessary plans, prepare documents and obtain necessary approvals of regulating authorities having jurisdiction; obtain all required Certificates of Inspection for Work and deliver to Architect before request for acceptance and final payment for Work.

J. Include in Work, without extra cost to Owner, labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) required to comply with applicable laws, ordinances, rules and regulations.

K. Conform to all rules, regulations, laws, and ordinances governing the area in which this construction occurs.

L. Obtain the required permits from the local authorities for this work and pay for all fees required by the State and Federal authorities for permits, inspections and review, including special agency construction and operating permits. Make corrections in the work as required by the Owner's Representative or Inspector to pass local regulations.

M. Provide local authorities with all notices relating to this Division.

N. Provide Owner, Owner's Representative and local Inspectors access to work at all times.

O. Contractor shall be responsible for all law violations caused by the work under this Division. Notify the Owner's Representative in writing when a discrepancy occurs between code requirements and work shown on drawings and resolve matter before proceeding with work.

P. Make application and pay for all certificates of inspection, taxes and permits required by Local, State or Federal Governments, public utilities, or other authorities having lawful jurisdiction. Deliver to the Owner's Representative any and all certificates of inspections, permits, and approvals that may be required by such authorities.

Q. All controlled inspections shall be the responsibility of the Contractor. The Contractor shall coordinate all inspections and provide all support and personnel necessary for successful completion.

R. Permits and Fees
   1. Make application and pay for all certificates of inspection, taxes and permits required by AHJs. Deliver to the Owner any and all certificates of inspections, permits, and approvals which may be required by AHJs.
   2. Pay all utility charges and charges for providing temporary and permanent water, sewer, and gas services to buildings.

1.6 GENERAL REQUIREMENTS

A. Provide a complete mechanical system in full working order without objectionable noise or vibration. The documents do not undertake to show or list every item to be provided. The Contractor shall examine the Documents at the time of the bid and notify the Architect/Engineer in writing of any and all discrepancies. When an item not shown or listed is necessary for the
proper operation of equipment which is shown or listed, provide an item which will allow the system to function properly at no increase in Contract Sum. Should there be any direct conflict in the specifications and drawings, an RFI shall be submitted with the Contractor’s suggestion for resolution.

1. Provide and install connection to district steam in compliance with District utility requirements and the drawings.
2. Provide and install complete direct digital control system, including devices, controllers, and sensors.
3. Provide testing, adjusting and balancing for all systems. Refer to Section 23 05 93.
4. Provide, design, dimension, coordinate, and install the following items specified as design build under specified performance criteria:
   a. Support and anchorage of all equipment, valving, piping, duct work, duct silencers and controls equipment and conduit. Refer to Section 23 05 29.
   b. Thermal and seismic expansion.
   c. Vibration isolation and seismic anchorage. Refer to Section 23 05 48.
   d. Controls programming, architecture, and conduit sizing and routing.
5. Provide all control devices for mechanical equipment and systems in conjunction with control system requirements, including coordination with Division 26 for electrical connection for complete, tested and operational systems.

B. Construction Documents Drawings and Data

1. The drawings show the general arrangement of all piping, ductwork, conduit and equipment. Examine drawings and specifications carefully, and notify the Owner's Representative by letter or Request for Information (RFI) of any discrepancies so these can be rectified at an early date.
2. Should conditions necessitate any rearrangements, the Contractor shall prepare and submit drawings showing the changes before proceeding with the work. If such changes are approved, they shall become a part of this contract after their approval.
3. Due to the small scale of the drawings, it is not possible to show all offsets and every detail of construction. Additional fittings, valves, traps, transitions, ducts, etc., shall be furnished and installed at no extra cost to the Owner. It is not the intent of Drawings and Specifications to repeat requirements of codes except where necessary for completeness or clarity.
4. The drawings are diagrammatic and are a graphic representation of the Contract Requirements, and are intended to convey scope of work. Dimensions of work as indicated on plans are not guaranteed to be as-built dimensions. No measurements shall be scaled from the Drawings for use as a definite dimension for layout or fitting work in place. Location of all items not definitely fixed by dimensions are approximate only. The Contractor is solely responsible for dimensional control and coordination of the work to be installed.
5. The layout of equipment, as shown on the plans, shall be checked and exact location determined by dimensions of equipment accepted for installation. Consult the Architectural and Structural Drawings for all dimensions, locations of partitions, sizes of structural members, foundations, etc. Exact locations necessary to secure best conditions shall be determined in field coordination and shall be approved by the Owner’s Representative prior to installation. In addition, the Owner’s Representative reserves right at no increase in contract sum to make any reasonable change in location of mechanical items exposed
at ceilings or on walls to group them in an orderly relationship or increase utility and access.

6. The Contractor shall be responsible for the coordination of the mechanical ducting and piping distribution with the fire sprinklers, lighting, conduit, cable tray, structural members, ceiling support and all other trades present within the project.

7. At the Owner’s direction, electronic files of the documents may be available to the Contractors subject to the following caveats:
   a. Provision of electronic files does not release the contractor from the requirements of the Contract Documents regarding coordination, submittals or any other issues outlined in the Contract Documents.
   b. The official Contract Documents are the hard copy versions, not the electronic files.
   c. The Contractor is responsible for all information extracted or inferred from the electronic files.
   d. Submission of the electronic file unchanged as a shop drawing will be rejected without review.
   e. These documents are provided only as a convenience to the Contractor. The Architect/Engineer is under no obligation to provide updated drawings during the Construction Phase or to track changes arising from RFIs, change orders, substitution requests, or submittal-generated alterations.

8. Information Location Precedence Chart.

9. (1st means primary precedence. A blank means that no geometrical information from that source may be used.)

10. | Item                                      | 3D files | 2D plan or section drawings | Detail Drawings/ single line diagrams | Specifications |
    |------------------------------------------|----------|-----------------------------|-------------------------------------|----------------|
    | Elevation                                | 1<sup>st</sup> |                              |                                     |                |
    | Horizontal location                      | 1<sup>st</sup> |                              |                                     |                |
    | Duct Size                                | 1<sup>st</sup> |                              |                                     |                |
    | Pipe Size                                | 2<sup>nd</sup> |                              | 1<sup>st</sup> for size limitations only |                |
    | Equipment physical size                  | 1<sup>st</sup> | 2<sup>nd</sup> |                                    |                |
    | Descriptive annotations                  | 1<sup>st</sup> | 2<sup>nd</sup> |                                    |                |
    | Repeated details such as equipment connection details | 1<sup>st</sup> | 2<sup>nd</sup> | 1<sup>st</sup> |                |
    | Insulation thickness                     | 1<sup>st</sup> |                              |                                     |                |
    | Pipe, duct, and equipment support /vibration isolation devices and locations | 2<sup>nd</sup> |                                    | 1<sup>st</sup>: performance specification |                |
    | Piping expansion compensation devices and locations | 3<sup>rd</sup> | 2<sup>nd</sup> | 1<sup>st</sup>: performance specification |                |
11. 3D files are for reference only and are not contractual sources of geometric information.
12. Any conflicts between 3D files, 2D files, sections, detail drawings, single line drawings, and specifications are to be resolved by a Request for Information (RFI).

C. Minor Deviation from Construction Documents

1. The equipment listed by model number and manufacturer in the plans and specifications has been selected for its capacity, certain standard construction features and specified optional features.

2. The dimensions and ratings of equipment herein specified or indicated on the Drawings are intended to establish the desired performance characteristics of such equipment. Minor deviations may be permitted after review by the Owner's Representative to allow manufacturers specified to bid on their nearest standard equipment that provides at least the performance required.

3. Manufacturers’ catalog or model numbers and types mentioned in the Specifications or indicated on the drawings are intended to be used as guides and shall not be interpreted as taking precedence over specific ratings or duty called for or shown, which modify stipulations in such catalogs. In all cases, the manufacturer shall verify the duty specified with the particular characteristics of the equipment he intends to submit, and shall submit only items which comply with Specification requirements.

4. Where the equipment furnished differs in physical character from that specified or indicated, or where Contractor’s substituted equipment requires increased service and facilities to be provided by other trades, and such substitution is acceptable to the Owner's Representative, the Contractor shall bear all costs of providing services, facilities and modifications to the system or building.

5. Where the equipment furnished requires redesign of systems, connections, or configuration, and such substitution is acceptable to the Owner’s Representative, the contractor shall bear all costs associated with design engineering and shall pay the time and materials cost of the Owner’s Representative’s review of this documentation. In addition, it is the contractor’s responsibility to obtain approval from the authority.

6. For routing of air, water, or steam distribution and conduits, the contractor is empowered to suggest an optimized routing or resizing, given that the routing has been entirely field coordinated, it adds no pressure drop, it does not disturb the functional intent, there is no
charge to the client, and all changes are explicitly annotated through symbols in the shop drawings as having deviated from the construction documents proposed routing solution.

7. The shifting of any item horizontally by less than 10’, the change of any elevation by less than 3’, the resizing of ductwork for equivalent frictional loss, and the necessary fittings in order to accomplish this shall all be construed as accommodation for field coordination and cannot be back-charged as change orders to the client.

1.7 SUBMITTALS PROCEDURES

A. Section 01 33 00 - Submittal Procedures: Submittal Procedures apply to this section. Where conflicts occur between divisions, the more stringent requirement shall apply.

B. Preliminary Submittals

1. Preliminary List of Materials, Equipment and Subcontractors
   a. Submit a Preliminary List of Materials, Equipment and Subcontractors to the Owner's Representative for approval of manufacturers of all materials and equipment proposed to be provided for this project, and contact information for all proposed Subcontractors. List shall be configured as follows:

<table>
<thead>
<tr>
<th>Specification/ Section number</th>
<th>Clause Number</th>
<th>Equipment Type</th>
<th>Proposed Manufacturer/ Model Series/ Contractor Name</th>
<th>Proposed Manufacturer/ Model Series/ Contractor contact information</th>
<th>Is this Manufacturer/ contractor named in the drawings?</th>
<th>Is this Manufacturer/ subcontractor named in the Specifications?</th>
<th>(For Owner's Representative)</th>
<th>Is this a Substitution?</th>
<th>Rejected?</th>
</tr>
</thead>
<tbody>
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<td>(For Owner's Representative)</td>
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<td>(For Owner's Representative)</td>
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<td></td>
</tr>
</tbody>
</table>

   b. List will be returned to the contractor with marks in the far right column with regards to whether the particular manufacturer is rejected due to poor past performance or known incompatibilities with the requirements. Lack of comment in these columns does not imply that the final manufacturer/model proposed will be acceptable. In all cases, the contractor bears the responsibilities to prove that the proposed product meets the specification and the performance required in the documents.

   c. The review of the Preliminary List of Material, Equipment and subcontractors shall only be construed to be a general review that the manufacturer or subcontractor is a recognized and reputable supplier of that general type of product or service and therefore eligible to submit in detail for review. The review designation of “no exception taken” to the Preliminary List does not exempt the Contractor from proving that the particular and specific equipment or Subcontractor meets the project’s requirements during the Submittal phase.

   d. Submit the List of Materials, Equipment and Subcontractors for review in accordance with Section 01 33 00: Submittal Procedures. Submit at least two months prior to the first submittal.

2. Submittal Schedule
a. Provide a submittal schedule at least two months prior to the first detailed submittal.
b. The submittal schedule shall be a complete list of all submittals to be made with submittal number, projected date of submittal, description of submittal by Specification or drawing number and whether a substitution is proposed.
c. The submittal schedule shall include worst-case submittal status, resolution date and the critical path’s target installation date, assuming at least one “Revise and Resubmit” cycle, and shall include the turnaround time period per Division 1. Complicated submittals, such as controls and motorized machinery, shall incorporate time for at least 2 “Revise and Resubmit” cycles. Delay to schedule associated with submittals’ “Revise and Resubmit” designation are ineligible for change orders or extensions of time, as timely and correct work is a requirement of this contract.
d. Concurrent submissions of multiple submittals shall incur a minimum of two times the turnaround time listed in Division 1, or longer, as agreed between reviewing party and the Owner’s Representative, based upon the amount and detail level of the documents requiring review. The following items shall be submitted for concurrent reviews:

1) All controls submissions shall arrive concurrently to allow cross-referencing.
2) All air handling equipment and duct silencers shall arrive concurrently.
3) All hydronic central plant equipment shall arrive concurrently.
4) All VFD submittals (including those embedded in equipment submittals as integral devices) shall be included in VFD harmonic mitigation calculation submittal for reference.
e. The contractor shall be responsible for equipment ordered and/or installed prior to receipt of submittals returned bearing the Architect/Engineers stamp of “No Exception Taken”. Corrections or modifications to equipment as noted on returned submittals shall be at the Contractor’s sole expense without additional compensation.

3. Shop Drawing Schedule
a. Provide a shop drawing submittal schedule that includes fixed dates of inter-trade coordination sign-off prior to submission, including TAB and controls Contractors.
b. The schedule shall be a complete list by drawing number of all shop drawings to be made, along with projected date of submission, worst-case shop drawing status resolution date, and critical path’s target installation date.
c. The submittal schedule shall assume at least one “Revise and Resubmit” cycle, and shall include the turnaround time period per Division 1. Delay to schedule associated with submittals’ “Revise and Resubmit” designation are ineligible for change orders or extensions of time, as timely and correct work is a requirement of this contract.

C. General Organization of Submittals
1. Submit as a minimum all the required data listed in the documents as specifying performance, material, and dimensions. Refer to individual specification sections, schedules, and drawings for requirements.
2. Organize submittals in the same sequence as they appear in specification sections, articles or paragraphs. Label each page with the appropriate specification clause number or drawing detail number.

3. Each submission shall be made under the Specification Section Number it has been specified under. Submittals including equipment specified under a different specification section will be rejected and returned without review. Each section is required to be tracked separately for status designation, even if multiple sections are physically collated into a single binder.

4. Identify each item within each submittal by reference to Specification Section paragraph in which the item is specified, or Drawing and Detail number. Annotate the submittal sheets with the equipment identification numbers appearing on the equipment schedule.

5. Include all information requested by the Specification Section in a single submittal. With the exception of shop drawings, incomplete submittals or phased submittals under the same specification section are not acceptable and will be returned without review, with the Contractor responsible for any resultant consequence.

6. Submit pertinent catalog and performance data sheets only. Annotate pages to clearly identify which specific product is submitted and for what tag number or application. Contractors shall not submit entire catalogs, extraneous information or optional choices. Contractor shall cross out any irrelevant information that may exist on the page, including unadopted options or alternative model types.

7. Submission shall be made in the form of a tab-indexed 3-ring brochure or binder of 8½” x 11” pages or 11” x 17” pre-folded to fit. Index sheets shall be required for all material and equipment, including pipe, valves, insulation, conduit and wire as listed. Index sheets shall be set up, in the same sequence as the specifications, with columns to identify the following:
   a. Specification clause number or drawing/detail number
   b. Item type
   c. Tag number as appropriate and/or application
   d. Requirement from drawing schedule and specification (multiple rows may be used)
   e. Equipment or manufacturer substitution request: yes or no
   f. Feature data provided to show compliance: yes or no
   g. Compliance: yes or no
   h. Notes from Contractor

8. Provide the number of submittal and shop drawing copies as defined under Section 01 33 00.

9. Illegible submittals will be rejected and returned without review.

D. Protect existing active services (water, gas, sewer, electric) when encountered, against damage from construction work. Do not prevent or disturb operation of active services which are to remain.

E. Equipment Submittals:
   1. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment. At a minimum, this should include all information scheduled. Words "as specified" are not sufficient identification.
   2. Mark the exact equipment item and data on each sheet. Where multiple product model types are listed on a single sheet, the contractor shall clearly indicate which specific item is submitted. If different model numbers of a single product line are submitted for differ-
ent uses, this should be clearly annotated, identifying each individual use cross-referenced by the requirement it intends to fulfill. Submittals without annotation will be rejected and returned without review.

3. Submittal literature, drawings and wiring diagrams shall be specifically applicable to this project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item and its relevant features or options. Submittals shall include all those items listed in each individual Section.

4. Where a certificate from a regulatory agency cannot be provided at time of submission, provide a letter describing methodology used to obtain certification, authority having jurisdiction, and anticipated date of certification.

5. All built-up equipment (such as air handlers or pump packages) shall be provided with a fully dimensioned shop drawing showing all hardware, points of connection, point loads at supports and center of gravity.

6. Submittals for all factory-built equipment weighing 40 lbs or more shall include a dimensional drawing, equipment weight, and center of gravity.

7. Provide the name and contact information for the three closest manufacturer representatives/service companies for the product.

8. Manufacturer’s certificate of performance and construction.

9. All equipment shall be UL listed as a complete assembly. Submit UL listing documentation with equipment submittals.

F. Shop Drawings:

1. Prepare reproducible CAD drawings in AutoCAD.

2. Shop drawings shall be provided for all systems included in Division 23 and for all areas addressed in the Construction Documents.

3. Ductwork and piping installation drawings shall be fully dimensioned complete with elevations and all fittings, valves, dampers, devices. Include details and dimensioned locations of supports, anchors and expansion devices. Dimensions shall be from gridlines. All equipment shall be shown to scale and shall match the required dimensions from the equipment submittals. All equipment access clearances shall be marked explicitly on the Shop Drawings with manufacturer and code required distances dimensioned and annotated as such.

4. The drawings shall be minimum 1/4” = 1'-0” scale

5. Ductwork and Piping shall be on separate drawings.
   a. Ductwork drawings shall include and show equipment with tags, access space, duct construction/material and reinforcing, pressure classification information, flexible duct, flexible connectors, duct support and seismic restraints (internal and external), Balancing devices, gauges/thermometers, controls, devices, penetration locations (including dimensions and elevation), insulation type and location.
   b. Piping drawings shall include and show equipment with tags, access space, pipe material, flexible pipe connectors, pipe support type and seismic restraints, balancing devices, gauges/thermometers/Pete’s plugs, controls devices, penetration locations (including dimensions and elevation), insulation type and location.

6. Penetration locations, structural support and structural pad drawings shall be submitted for review by Structural Engineer.

7. All equipment shall be labeled to match the schedules. All equipment shall be drawn to scale per the approved submittals, providing notes to identify approved submittal number for all pieces of equipment.
8. The Contractor shall ensure that each trade has coordinated work with other trades, prior to submittal. Division 23 shop drawings shall be issued after the coordination drawings are signed off by all other trades and after the system pressure loss calculations are complete. Any conflicts that occur with other trades shall be brought to the attention of the Owner's Representative prior to issuance of the shop drawings.

9. Shop fabrication, coordination and installation drawings that are prepared to scale by the Contractor are for his use and shall be his responsibility. These Drawings indicate where he intends to install the material and equipment as required by the Contract Documents. Submission of contract documents or electronic files of contract documents for shop drawings is not sufficient as this would be an indication that field-level construction coordination has not taken place. Any such submittal will be rejected and returned without review.

10. Prepare and submit supplementary Shop Drawings for all Work in "tight" areas, clearly indicating solutions to space problems and coordination with Work in other Sections. Identify congested conditions and provide a sufficient number of sections to demonstrate the solution proposed. These Drawings, as a requirement of this Division, shall indicate, superimposed, Work of all Sections involved in congested area, including ductwork, piping, electrical work, ceiling work, equipment access requirements, etc. Include all mechanical rooms at larger scale and with sections under this clause. Identification of space problems without solutions is not acceptable within a shop drawing.

11. During the shop drawing review process the Owner's Representative may request that supplementary shop drawings be produced for clarification and explicit demonstration of coordination in congested areas. This work shall be performed by the contractor at no cost as necessary under the previous clause.

12. Prepare and submit Shop Drawings for all Work deviating from that indicated on Contract Drawings. Clearly indicate deviations and cross reference through notes the reason why the deviation was made.

13. Shop Drawings shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, weight.
   a. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of the Contract Documents.
   b. Drawings shall be to scale and dimensioned (except piping diagrams not to scale).
   c. Drawings shall clearly show all required openings in construction, points of connection of other trades, and support locations and loads.
   d. Drawings may be prepared by vendor but shall be submitted as instruments of the Contractor. Such drawings shall be thoroughly checked and developed by the contractor to include the full contract scope. They shall be stamped by Contractor before submission for review.
   e. Catalog cuts and published material may be included to supplement scale drawings.

14. Each drawing shall have a blank space for use by the Owner's Representative and Contractor in recording disposition of material per Section 01 33 00.

G. Coordinated Drawings:
   1. Refer to Section 01 33 00 Submittal Procedures for requirements.
2. Color Coordinated drawings (with different color per trade) shall be provided for all areas with acceptance sign off from all trades required at time of shop drawing submittals, including, but not limited to:
   a. Plumbing Contractor
   b. Electrical Contractor
   c. IT Contractor
   d. AV Contractor
   e. Ceiling Support Contractor
   f. General Contractor
   g. Testing Adjusting and Balancing Contractor
   h. Controls Contractor
   i. Fire Sprinkler Contractor
   j. Fire Alarm Contractor

3. Coordinated Drawings shall show work of all trades including, but not limited to:
   a. Ductwork with fully-dimensional sized and locations of penetrations at floors, walls, ceiling and roof.
   b. Piping, including:
      1) HVAC, Plumbing and Fire Protection.
      2) Minor Piping such as Drains, Air Vents, Condensate Piping, etc.
      3) Sleeves and fully-dimensional sized and locations of Penetrations.
      4) Expansion Devices, Anchors, Guides and Hangers, Seismic Anchorage Devices.
   c. Actual Mechanical Equipment at submitted dimensions, including points of connection and manufacturer’s recommended access space. Nothing shall enter or cross through the code-required and manufacturer recommended access space, which is defined as the volume extending from the top of the device to be maintained down to the floor (inclusive of access door locations and swings). Any ceiling which interrupts this space shall be entirely removable including T-bars, vertical supports and seismic bracing of ceiling which shall be arranged to avoid the access zone.
   d. Pipe Supports and Suspension Devices, including seismic restraints.
   e. Ductwork
   f. Piping High Points and Low Points.
   g. Electrical Equipment.
   h. Main Electrical Conduits and Bus Ducts.
   i. Equipment Support and Suspension Devices including Hangers, Supports and Bracing.
   j. Structural and Architectural Constraints including Beams, Braces, Trusses, Flanges, Constraints, Walls, Openings Ratings, Doors, Wall Types and Glazing.
   k. Show location of:
      1) Valves.
      2) Chemical Treatment.
      3) Piping Specialties.
      4) Dampers.
      6) Control and Electrical Panels.
8) Temperature / Humidity Sensors and Thermostats / Humidistats.
9) All control sensors, control panels and required installation distances for access and stable performance.
10) Mounting Brackets

l. Testing, Adjusting and Balancing devices
m. Controls devices and sensors, including required distances for uninterrupted flows to obstruction
n. Electrical point of connections
o. Controls points of connection
p. Fire Alarm points of connection

4. Drawings shall indicate coordination with work in other Divisions which must be incorporated in mechanical spaces, including, but not limited to:
   a. Irrigation Equipment and Piping.
   b. Elevator Equipment.
   c. Electrical Equipment.
   d. Cable Trays.
   e. Architectural features, including doors and partitions
   f. IT/Electrical outlets
   g. Plumbing equipment

5. Provide sections and elevations for all mechanical rooms, mechanical areas, areas with routed duct mains, areas with routed piping mains, and areas adjacent to the existing structure.

6. Difference or disputes concerning coordination, interference or extent of Work between sections shall be decided by Contractor, his decision, if consistent with Contract Document requirements, shall be final.

7. Provide templates, information and instructions to other Divisions to properly locate holes and openings to be cut or provided.

8. Not all offsets in ductwork or piping are shown. Contractor shall decide which item to offset or relocate. Maintain required slope in piping.

9. Provide wiring diagrams for electrical, controls and fire alarm systems cross referencing panel location/circuit number/point name as appropriate.

H. Substitutions:

1. In accordance with Section 01 60 00, and where permitted in each section.
2. Specified products or equipment mean those named on the equipment schedules or identified as Specified Manufacturers herein. All other manufacturers listed are considered substitutions and must meet the requirements of this Section. Only manufacturers identified as Possible Substitutions in this specification may be offered as substitutions for approval.

3. Substitution requests shall come simultaneous to the relevant submittal and shall not come through the RFI process, unless directed by the Owner’s Representative. The first page of the submittal containing the substitution request shall explicitly include a table of contents identifying the location of the official substitution request paperwork, the table of comparisons, and the supporting data.
4. Submit shop drawings of proposed products that differ from the specified products to demonstrate equivalency of connections and physical arrangements. Show necessary modifications of architectural, structural, plumbing, electrical and mechanical Work required by the proposed products, including relocation of drains, revised electrical circuits, relocation of roof or wall penetrations, and revised foundations.

5. Accompany request for substitution review with table of comparison listing pertinent features of both specified and proposed materials including all scheduled data, material of construction, performance criteria, overall length, width, height dimensions, space required for replacement or maintenance access, motor type, horsepower, voltage, phase service factor, noise levels and controls. This is to be submitted in addition to the index sheet required above for all submittals. Review of proposed substitution will not be made without simultaneous receipt of satisfactory comparison tabulation. The substitution request shall also identify the offered reduction in contract value, which shall be inclusive of all cost associated with work by other trades. If paper copies of data from the reference manufacturer are provided along with the submitted manufacturer as backup data for the table of comparisons, these shall be explicitly separated via tabs clearly marked as follows:
   a. Substitution request, comparison table, letter sign-off by all affected subcontractors verifying that there is no charge to the project associated with the substitution
   b. Submitted data from requested manufacturer
   c. Reference data from specified manufacturer

6. Limit submittal of substitutions to one proposal for each type or kind of item. If the proposed product substitution is rejected, submit the specified product at no cost to the project.

7. Review of drawings and other material submitted as a substitution shall not be construed as a complete check or constitute a waiver of the requirements of the Contract Documents. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided, and to effect necessary rearrangement or construction of other Work. The submittal response of “No Exception Taken” to a substitution request does not constitute a design change or a direction from the Owner and it is not eligible for a change order request.

8. Any additional work required by other trades as a result of a substitution shall be covered under this Contract, without any additional cost or time delay imposed on the project. Submittals with substitution requests shall include a letter signed by all affected parties (electrical, controls, testing, adjusting, and balancing, general contractor, structural capacity) verifying that the substitution will not incur any additional cost or time delay to the overall project.

9. When a substitution is proposed, the Contractor shall be responsible to ensure that the performance and quality of the scheduled or specified equipment is met. If additional accessories are required to achieve performance, they shall be provided at no cost.

10. Substitutions shall be made explicit during the project buy-out/bid phase (e.g. guaranteed maximum pricing). Selection of the sub-contractor does not imply acceptance of substitutions.

I. Submittals – Checking

1. Before submitting shop drawings or equipment submittals to the Owner's Representative, the contractor shall check them in detail to be sure that all requirements of the plans and specifications have been fully met.
2. Incomplete submittals and submittals not in accordance with the above requirements shall be returned without action, and resubmittal shall be required.
3. Review of drawings and other material submitted shall not be construed as a complete check or constitute a waiver of the requirements of the Contract Documents. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided, to coordinate with the other trades and to effect necessary rearrangement or construction of other Work.
4. Review is not intended to verify dimensions or quantities, or to coordinate items shown on these Drawings. Review is for general conformance with design concept of the Project and general compliance with the information given in the Contract Documents. Contractor is responsible for dimensions, which shall be confirmed and correlated at the Jobsite, for fabrication processes and techniques or construction, for coordination of his Work with that of all other trades, for installed performance and the satisfactory quality of his work.
5. Review by the Owner's Representative of Submittals does not release the Contractor from full compliance with the requirements of the plans and specifications when Submittals deviate from these requirements.
6. Even though Submittals have been stamped "Reviewed" and no exceptions have been taken by the Engineer, the Contractor shall be fully responsible for all unauthorized deviations from the Drawings and specifications. Authorization for deviation will be made only by means of a letter from the Owner's Representative. The Owner's Representative's reviewed "No Exceptions Taken" stamp on a Submittal is not an authorization for a deviation from the plans and specifications.
7. Any corrections or modifications made by the Owner's Representative shall be deemed acceptable to the Contractor with no change in contract amount unless written notice is received by the Owner's Representative prior to the performance of any work affected by any corrections or modifications.
8. No material or equipment shall be released for manufacture or shipment without first obtaining the Owner's Representative approved shop drawings.

J. Resubmittals

1. Resubmittals shall be reviewed for compliance with the comments made on the original submittal. Clearly identify replies to comments, through a cover letter by the Contractor that lists each comment and the resolution of that comment. Mark with submittal number and date.
2. Non-compliant items which were not noticed in an earlier submittal but are noticed in a resubmittal shall be noted as non-compliant and the resubmittal tagged for corrective action. The fact that the Owner’s Representative may have overlooked the defect shall not constitute total or partial acceptance of it. The contractor remains responsible for delivering an installation that meets the design intent. All corrective action shall be performed at no additional cost or delay to the project.
3. Re-submittals shall be complete and shall be explicitly annotated to note all changes. Contractor shall not just include specific responses to review comments, but shall show how the resubmittal data has been corrected and how all consequences of the change have been accommodated.
4. Changes made in the resubmittal which are not directly a response to an earlier review comment shall be clearly identified on the letter of transmittal provided with the re-
submittal and annotated within the body of the submittal. The reason for the change shall be included.

5. One resubmittal will be reviewed. Review time for all second and higher resubmittals will be charged on a time and materials basis to the contractor regardless of the cause of the resubmittal. This will include all submittals to change manufacturer or equipment type after an original submittal was returned with no exceptions taken, unless the change is directly related to a Bulletin.

1.8 PROJECT RECORD DOCUMENTS

A. In accordance with Section 01 77 00 – Contract Closeout: Record Documents, and as follows.

B. Keep up-to-date during the progress of the job through one set of drawings indicating the Record installation. In addition to changes made during course of Work, show following by dimension from readily obtained base line reference points:

1. Exact location, type, and function of all valves, dampers, and controllers (cross-referenced to valve, damper and sensor/controller charts).
2. Exact size, invert elevations and location of underground and underfloor piping and ducts, and ducts and piping concealed or exposed in walls.
   a. Dimensional changes to Drawings.
   b. Revision to details shown on Drawings.
   c. Depths of foundations.
   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 Construction Change Directives.
   k. Details not on original Construction Drawings.

C. Underground utility services, both inside and outside of buildings, shall be dimensioned from permanent structures or bend mark. Utility services outside of buildings shall also show depth of burial with reference to the finished ground floor elevation. Mark record prints of Construction Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Construction Drawings location.

1. Mark record sets with red erasable colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location. All notations shall be dated and initialed. Record drawings shall note related change order designations (numbers) on impacted work.
2. Mark important additional information that was either shown schematically or omitted from original Drawings.
3. Note alternate numbers, Change Order numbers, and similar identifications.
4. Responsibility for Markup: Under direct supervision of Contractor, the individual, installer, subcontractor or other entity who obtained record data shall prepare markup on record drawings.
   a. Accurately record information in an understandable drawing technique.
b. Record data as soon as possible after obtaining it. Record and check markup prior to enclosing concealed installations.

c. Encircle each area of change or additional information with a free-form cloud-shape drawn on the reverse side of the transparency.

d. Identify changes and additional information by printing Change Order Number or other change reference designation, when applicable, within the cloud-shape encircled area.

5. During construction phase, maintain in addition to hard copy, an electronic record document of drawings on CAD file, with 2 back up copies.

6. Transfer markup’s from hard copy to CAD files on a monthly basis.

7. Submit one hard copy of changes made to CAD files as part of monthly request for payment.

8. Provide and maintain a list of drawings.

D. A complete progress set of drawings shall be kept on the project site at all times and shall be available for inspection by Owner’s Representative or Construction Manager weekly, as a “record” set.

E. Each trade shall submit record copies of their respective shop drawings as part of the project closeout. These record copies shall indicate as-built conditions and shall show all work installed by that trade. All elements shall be dimensioned from grid lines or bench marks and all elevations shall be noted. Construction notes such as component number or conflict notes shall be removed and the drawings shall clearly be noted in the title block as being as-built drawings.

F. Newly Prepared Record Drawings: Prepare new drawings instead of following procedures specified for preparing record drawings where new drawings are required when neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation. New drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.

1. Provide Drawings in a scale that allows for scope of detailing and notations required to record actual physical installation and its relationship to other construction.

2. When completed and accepted, integrate newly prepared Drawings with procedures specified for organizing, copying, binding and submitting record drawings.

G. Submit as a normal submittal, a copy of the completed progress set Drawings and the final draft of the project record drawings to Owner’s Representative for approval prior to authorization for final payment. Record drawings shall be certified as to their correctness by the signature of the Contractor and shall be stamped or otherwise identified as record drawings.

H. Prior to Final Acceptance, submit record drawings to the Owner. Organize into sets, and bind and label.

I. At the completion of the project prior to the authorization for final payment, the Contractor shall submit record as-built drawings with numbers of copies as specified under Section 01 77 00 and their electronic CAD files, including all associated reference files, files related to line weights/color for printing, and a PDF print of the intended final drawing product. Drawings shall incorporate all the Owner’s comments and corrections, submittal information, RFI information and all addenda and represent completed as-built conditions. Reference to RFI’s or Change Orders in lieu of drawing the exact change will not be acceptable. Title block shall ex-
licitly note these as “PROJECT RECORD DRAWINGS” in a prominent location on each drawing.

J. Contractor shall deliver rolls or binders that contain each drawing, whether or not changes and additional information were recorded, such that each copy is a complete as-built representation of the installed work.

1. Organize hard copies into manageable sets. Bind each set with durable-paper cover sheets. Include appropriate identification, including titles, dates, and other information on the cover sheets.
2. Organize and bind original marked-up set of prints that were maintained during construction period in same manner.
3. Submit marked-up progress set, record set, CAD files, and copy sets to the Owner.

1.9 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Instructions and Manuals: Provide number of copies in accordance with requirements of Section 01 77 00 and parallel electronic documentation organized in directories. Additional requirements are parallel to the paper copies. Additional requirements are as follows:

1. Submit certificate, signed by Owner’s Representative, attesting to their having been instructed per Section 01 77 00 and as specified under individual Equipment sections of this specification.
2. Instructions on major items such as pumps, chillers, boilers, water heaters, water treatment, fans, air handlers, and temperature control shall be by representative of manufacturer of the respective equipment.
3. Schedule training with Owner’s representative a minimum of 5 working days in advance. All Owner training shall be completed prior to scheduling final inspection.
4. One month prior to request for final inspection, submit Operating and Maintenance manuals and electronic documentation under Section 01 77 00.
5. Manuals shall be prepared to ASHRAE Guideline 4-2008. The manuals shall be predominately typewritten with occasional printing or hand-drawn demarcations and notes. Shall include the following in the Equipment Binder(s):
   a. Section 1: Overview documents:
      1) A comprehensive table of contents and guide to the manuals contents and layout. This section shall enable the reader to comprehend the scope and purpose of the document and to identify readily where specific information can be obtained.
      2) Equipment List: List of all major equipment as installed. Include tag reference model number, normal capacities, location in building, and location tab number in Section 3 binders.
      3) Manual valve charts organized on a room and sequence basis, identifying room, system, valve numbers, valve type, valve usage, and associated equipment.
      4) Manual fire and fire smoke damper charts organized by type on a room and system basis, detailing room system and damper number.
   b. Section 2: Contractual and Legal Records including:
      1) Name and Address of the installation.
      2) Contact Name and telephone number for emergency repairs.
      3) Details of City and State approvals.
4) Name and Contact details of the Design Team and Installing Contractors and associated sub-contractors.

5) Copies of maintenance service contracts and contact details for local service company.

6) Master Equipment List containing Dates for Start of Installation, Substantial Completion, and Expiry of Warrantee period.

7) Copies of warranties, guarantees and bonds.

c. Section 3: Individual Equipment Sections:

1) Startup and Shutdown Procedures:
   a) Provide a step-by-step write-up of all major equipment. When manufacturer's printed start-up, troubleshooting and shut-down procedures are available, they shall be incorporated into the operating manual for reference.

2) Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.

3) Service Instructions: Provide the following information for all pieces of equipment:
   a) A detailed parts list
   b) Recommended spare parts, including catalog number and the name, manufacturer's name and contact information, address and telephone number of local suppliers of factory representative.
   c) Lubrication and maintenance instructions and recommended service maintenance schedule for all equipment including all electric motors. Sample maintenance record forms for each equipment type.
   d) A lubrication chart listing each item of equipment, all points of lubrication, proper lubricant, dates lubricated, and lubrication schedule.
   e) Belt sizes, types and lengths – adjustments made to install systems.

4) Data sheets to show model number, capacity, nameplate data, complete internal wiring, mechanical and electrical ratings and characteristics, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or electrical failure, and description of operating, test, adjustment, and maintenance procedures.
   a) Where data sheets included in the manual include equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
   b) Parts catalog references for each item of equipment furnished with components identified by number for replacement.
   c) Final submittals for equipment shall have final corrections included in the points used for the manual.

5) Testing and Balancing reports:
   a) Sheets detailing all set points, and final balance figures of air and water systems.
   b) Cross-reference diagrams in plan to identify air terminals and equipment location.
   c) NC levels by room
   d) Pressurization testing results (as applicable).
d. Section 4: Controls:
1) Title index tabs identifying items therein.
2) Detailed list of all sensors, devices, and controllers cross reference to control set points names. List shall cross reference physical location in building, control and wiring diagrams and documentation in this section.
3) Software name/version and support contact information.
4) Detailed description of sequence of operation of each system, with charts and diagrams. Include emergency operation performance and resetting procedures as appropriate. Include explicit definition of all setpoints, alarm triggers, loop tuning coefficients, and ranges present within programming at time of handover.
5) Provide full size copies of Record one-line diagrams and plans, thin laminated and folded into plastic envelopes for inclusion in the binder.
6) Provide laminated control diagrams. Diagrams shall show complete equipment, controls, model numbers, etc., marked to correspond to identification on equipment.
7) Provide second copy of Record one-line diagrams and controls diagrams framed with glass front for installation as directed by the Owner’s representative.

e. Section 5: Certification:
1) Title index tabs identifying items therein.
2) Certificates: Submit final inspection certificates signed by governing authorities.
3) Letters from manufacturers certifying their supervision of equipment installation and start-up procedures.
4) Machinery vibration test reports.
5) Room NC levels at handover as tested by an acoustical engineer.
6) Test certificates.
7) Instruction certificates.
8) Inspection certificates.
9) Fire Marshal and/or Fire Department approvals of system.
10) Final inspection certificate signed by governing authorities.
11) UL, ASME and ASTM rating certificates (as appropriate).
12) Air Quality Management District certification of boilers.
13) Other certification as noted in other Division 23 sections.
f. Section 6: Record As-Built Drawings: Submit drafts of service and maintenance instruction sheets to Owner’s Representative for review before preparing final sets.

g. Section 7: Video documentation of training sessions

h. Section 8: CD’s containing O&M Manual as electronic versions

1.10 WARRANTY

A. Unless otherwise noted within a particular section, under special warranty each complete system shall be warranted by the Contractor. Each system shall be free of defects of materials and workmanship, and shall perform satisfactory under all conditions of load or service. The warranties shall provide that all additional controls, protective devices or equipment provided as necessary to make the system or equipment operate satisfactorily and than any faulty materials or workmanship shall be replaced or repaired. On failure of the warrantor to do the above after written notice from Owner, the Owner shall have the Work done at the cost of the warrantor.
Loss of refrigerant is considered a defect in workmanship and/or equipment, to be corrected at no extra cost to the Owner.

B. Provide new materials, equipment, apparatus and labor to replace that determined by Owner to be defective or faulty within the warranty period.

C. This guarantee also applies to services including Instructions, Testing, Adjusting, Balancing, Noise and Commissioning.

D. Furnish Manufacturers’ standard Warranties in excess of the period specifically required under the individual equipment section.

E. Unless otherwise noted, warranties shall commence upon the Owner’s final acceptance of the project.

1.11 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

C. Nothing in these plans or specifications is to be construed to permit work not conforming to the prevailing codes and regulations. Should there be any direct conflict between any referenced standard and the governing code, the mandatory code language shall govern to set only the minimum requirements and the most stringent requirement shall govern. A letter or Request for Information (RFI) shall be generated to highlight the discrepancy.

D. Install Work by craftsmen skilled in the trade involved and by apprentices as indicated in the General Conditions.

E. The Contractor recognizes that the design is based upon the equipment and material specified by name or construction and the Contractor accepts full responsibility for assuring that the quality, utility and performance of a substitution equals or exceeds that of the specified item.

F. Electrical Testing: Provide the services of a qualified testing laboratory/agency to perform the specified field tests. Notify the Owner's Representative 24 hours in advance of performance of Work requiring testing. Provide all materials required for testing. Refer to Division 26 for detailed requirements of electrical testing.

G. Factory and Field Testing

1. See each Section for the required testing and procedures.
2. Provide the services of a qualified testing laboratory/agency to perform the specified field tests.
3. Notify the owner’s representative at least 72 hours in advance of tests.
4. Provide all materials required for testing.
5. Test reports shall include:
a. Description of equipment tested.
b. Description of test procedures.
c. Test results.
d. Names and signatures of witnesses of tests.

H. Performance testing
1. Upon completion of the work and following adjustment of all equipment, conduct an operating test for each system's acceptance. Demonstrate all systems and equipment to be operational and free from all electrical and mechanical defects.
2. Notify the Owner's Representative fourteen days in advance of when tests will be performed. At that time, provide a test procedure plan, test schedule and test procedure forms.
3. Coordinate the work of Performance Testing with the Commissioning Requirements for Pre-Functional and Functional Testing.

I. Any appliance for which there is an ASHRAE 90.1 standard established regarding appliance efficiency shall comply with the applicable standard.

J. Materials and Workmanship
1. Materials shall be new, meet detailed requirements of the contract document and be identifiable as being specified or substitute products. Materials shall be kept in original packing material and protected from the elements by plastic and placed on dunnage until the item is installed. Once installed, all electrical devices exposed interior materials and all insulation installed shall be covered with sealed plastic until the building is fully enclosed and all spraying applications are complete.
2. Materials that do not conform to the requirements of the contract documents, are not equal to approved samples or are unsatisfactory or unsuited to the purpose for which they are intended, will be rejected and shall not be installed.
3. All work shall be performed by properly licensed plumbers, mechanics, and technicians with work limited to their respective trades.
4. All equipment shall be installed in accordance with the recommendation of the manufacturer. Use printed descriptions, specifications and recommendations of manufacturers as a guide for installation of Work.
5. Defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or other cause shall be removed within ten (10) days after written notice is given by the Owner's Representative, and the work shall be re-executed by the Contractor. The fact that the Owner's Representative may have previously overlooked such defective work shall not constitute acceptance of it.
6. In no case shall a Bidder base his bid on a class of material or workmanship less than that required by the contract documents and the governing codes and ordinances.
7. Materials and adhesives used throughout the mechanical systems for insulation, filters, ducts, flexible connections and jackets or coverings regardless of kind for piping and ducting system components, shall have a flame spread rating not over 25 without evidence of continued combustion and with a smoke developed rating not higher than 50. "Flame Spread Rating" and "Smoke Developed Rating" shall be as determined by the "method of test of surface burning characteristics of building materials, NFPA No. 244, ASTM E84, Underwriters Laboratories, Inc., Standard". Such materials are listed in the Underwriters Laboratories, Inc., "Building Materials List" under the heading "Hazard Classification (Fire)".

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8. Equipment shall be approved for use by all relevant Authorities Having Jurisdiction, where applicable.
9. Equipment required to have test labels by requirements of individual equipment sections shall have labels permanently affixed.
10. Manufacturer’s nameplate, name or trademark shall be permanently affixed to all equipment and material furnished under this Specification. The nameplate of the Subcontractor or Distributor is not acceptable.

K. All Base Materials: Comply with standard ASTM and ANSI.
L. All Pressure Vessels, Relief Valves, Safety Relief Valves and Safety Valves: Comply with standards, ASME stamped.
M. All Electrical Devices and Wiring: Conform to standards of NEC. All devices: UL listed and identified.
N. Applicator (Erector) Qualifications:
   1. All equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.
   2. All equipment and accessories new, free from defects.
   3. Supply all equipment and accessories in compliance with the applicable standards listed in this Section and with all applicable national, state and local codes.
   4. All items of a given type shall be the product of the same manufacturer.
   5. Electrical equipment: Listed by UL and bearing their label.
O. Checking and Testing Equipment By Contractors and Manufacturer's Representative
   1. All equipment shall be installed per the manufacturer's instructions. During construction request supervisory assistance from equipment manufacturer's representatives so the equipment will be correctly installed. After installation, request the Owner's Representative to inspect and see the equipment is in proper working order.
   2. Manufacturer's representative shall review the overall system design relative to the proper application of his equipment in the particular system. He shall note conduit, wiring, control, location, and other relevant relationships, and furnish appurtenances necessary for satisfactory operation.
   3. Before equipment start up, the manufacturer's representative shall submit to the Owner's Representative, a signed statement certifying to their inspection and noting that the equipment is properly installed and ready for operation.

1.12 PRE-INSTALLATION MEETINGS
   A. Convene minimum one week prior to commencing work of this section.
1.13 PROTECTION, DELIVERY, STORAGE, AND HANDLING
   A. Contractor to provide an authorized representative to constantly supervise Work of this Division, check all materials prior to installation for conformance with Drawings, Specifications, and reviewed Shop Drawings.
   B. Delivery
1. Deliver materials or equipment to the Project in the manufacturer’s original unopened, labeled containers and adequately protect against moisture, tampering or damage from improper handling or storage, ingress of dirt or contamination of any kind. Do not deliver materials to the job before they are ready for installation, unless adequate security is provided.

2. Perform all handling and shipping in accordance with manufacturer’s instructions.

3. All ductwork shall be delivered to site with all ends and openings capped with heavy gauge polythene sheeting taped all around to prevent ingress of moisture, dust, and debris.

4. Deliver equipment in its original package to prevent damage or entrance of foreign matter. Perform all handling and shipping in accordance with manufacturer’s recommendations. Provide protective coverings during construction.

5. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Identification

1. Identify materials and equipment delivered to Site to permit check against approved materials list, reviewed Shop Drawings. Identify materials and equipment by manufacturer’s name, tag reference and nameplate data. Remove unidentified materials, equipment from Site.

D. Loss or Damage

1. All materials, appliances, and equipment shall be new and free from defects, and of the make, brand or quality specified or as accepted by the Owner. All materials and equipment shall be installed in a neat and workmanlike manner. Any work not so installed shall be removed and replaced in a satisfactory manner at no charge to the Owner.

2. Equipment or material damaged during transportation, installation or operation is considered as totally damaged. Replace with new. Variance from this permitted only with written acceptance.

3. The Contractor shall replace lost or damaged materials and equipment with new at no increase in Contract Sum.

E. Storage

1. All stock-piled material shall be placed on pallets, and protected from weather and from entry of foreign material and construction dust by plastic. All stored materials and equipment shall be carefully inspected and cleaned prior to installation and replaced with new material or equipment if found to be damaged, corroded, etc.

2. Equipment which is observed to be exposed to the weather, dirt or construction debris can be interpreted by the Owner’s Representative as defective equipment under this clause.

3. All stored materials and equipment shall be carefully inspected prior to installation and replaced with new material or equipment if found to be damaged or corroded.

4. Completely cover motors and other moving machinery to protect from dirt and water during construction, including after installation.

5. Cap all openings in pipe and ductwork daily to protect against entry by foreign matter.

7. Protect all finished surfaces of fixtures and exposed to view materials with heavy plastic or by other means, throughout the period of construction.

F. Waterproof Construction
1. Maintain waterproof integrity of penetrations of materials intended to be waterproof. Provide flashings at exterior wall and roof penetrations. Caulk watertight penetrations of foundation walls, above grade walls, roofs, and floors. Provide membrane clamps at penetrations of waterproof membranes.
2. Provide galvanized sheet metal weather protection canopies, hoods or enclosures over all out-of-doors equipment, the operation or maintenance of which would be impaired by rain water. This requirement applies to damper operations and bearing, damper motors, controls and instruments. See other paragraphs in this Division for application of this requirement to motors, drive, ducts and fans.
3. If ductwork, piping, insulation or any damper or valve is installed in a riser prior to the permanent roof construction of that riser is complete, provide auxiliary sheet metal, drain piping, and caulking to ensure watertight caps on all temporary riser top openings that occur during the construction process. Take responsibility to ensure that watertight protection is provided continuously except when actual work is being done at the opening.

1.14 TEMPORARY FACILITIES
A. Temporary Water: Provided under Section 01 50 00.
B. Temporary Light and Power: Provided under Section 01 50 00.
C. Temporary air-conditioning: Provide conditioning sources for use during construction that are independent of the building’s air handling systems. Building air handlers shall not be used during construction unless explicitly approved for use by the Owner’s Representative.
D. Temporary heating and ventilation: Provide heating and ventilation sources for use during construction that are independent of the building’s air handling systems. Building air handlers shall not be used during construction unless explicitly approved for use by the Owner’s Representative.
E. Where retrofit work to the central plant requires that the equipment is taken off line, the contractor shall provide temporary cooling and/or heating facilities to ensure continuous building operation in the areas occupied during construction. All such switchovers to temporary cooling and heating shall be scheduled and coordinated with the Owner’s Representative at least one month prior to the event. The Work may require shutdowns to be accomplished on an “overtime” basis without additional cost to the Owner.
F. Where retrofit work requires connection to the central plant or other building plant, the contractor shall complete the work prior to the connection with the plant to minimize the impact of the plant shutdown (e.g. time or cost), subject to the requirements of the Owner.
G. Contractor shall assume responsibility for chemical treatment and freeze protection during use of temporary facilities.
H. Contractor shall assume responsibility for selectively disconnecting and isolating piping and ductwork systems requiring work under this scope while the rest of the system remains in service. All disconnected systems will be capped and protected from construction debris in the interim during construction, as well as treated as needed to prevent any physical, chemical, or biological damage associated with disuse over time.

I. All temporary facilities shall be removed at completion of project, with permanent facilities returned to proper working order.

1.15 COORDINATION

A. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

B. Cooperate with all other Divisions performing work on this project as necessary to achieve a complete neatly fitted installation for each condition. Consult the Drawings and Specifications to determine nature and extent of work specified in other Divisions that adjoins, shares space with, or attaches to the work of this Division. Confer with other Divisions at the site to coordinate this work with theirs in view of job conditions to the end that interferences may be eliminated and that maximum headroom and clearance may be obtained. In the event that interferences develop, the Owner's Representative's decision will be final as to which Division shall relocate its work, and no additional compensation will be allowed for the moving of piping, ductwork, conduit or equipment to clear such interferences.

C. For Testing and Balancing of the system, ensure full co-ordination between the Testing and Balancing subcontractor and all other Trades to achieve access to all system components including leaving wall/ceiling sections down for access.

D. Coordination with Structural Work

1. Schedule of Work: In accordance with Division 01 - General Requirements and as follows:

   e. Arrange work to conform to schedule of construction established or required to comply with Contract Documents.
   f. In scheduling, anticipate means of installing equipment through available openings in structure.
   g. Ascertain temporary openings required for admission of apparatus. Notify the General Contractor and Architect accordingly. Provide such openings at no additional cost to the Owner.

2. Openings and penetrations are prohibited in structural members, except where shown or as directed by the Owner’s Representative and the building’s Structural Engineer in writing.

3. At the start of the project, meet with the Owner’s Representative to obtain information regarding allowable sleeve or penetration spacing and size.

4. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

5. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
6. The Contractor shall be responsible for being aware of the nature and arrangement of the materials and construction to which the work attaches or passes through, and shall propose support and penetration details that are consistent with maintaining the integrity and performance of the construction such as, but not limited to, fire-resistive construction, acoustically rated construction, vibrated isolated construction, water tight construction, fire proofed construction, and isolated construction.

7. The Contractor shall do all cutting, sleeving, core drilling and carpentry of building materials, piping, etc., as required for the installation of work.

8. All cutting shall be performed with machine saw. Holes for pipes in concrete walls or floors shall be drilled with core drilling equipment. Verify location of all such cutting or core-drilling with the structural engineer prior to execution.

9. Where any Mechanical work cannot be installed as the work progresses, the Contractor shall provide and arrange for the building in of boxes, sleeves, inserts, fixtures or devices as necessary to permit installation of the omitted work during later phases of construction. This field coordination work shall be completed prior to structural shop drawings and shall follow the principles set forth in the meeting reference above. Arrange for and lay out any chases, holes, or other openings that must be provided in masonry, concrete or other work.

10. This work shall be incorporated into the initial shop drawing review of the construction (wall, floor, etc.) that is affected so that the Owner’s Representative may review the impact of the holes.

11. Once the structural shop drawings are returned with no exception taken, the contractor shall bear the cost of time and materials for the Owner’s Representative to review the appropriateness of cutting or drilled holes in planned or existing construction.

12. The Contractor shall be responsible for ensuring that all openings shown on the drawings or otherwise required are provided by the relevant trade contractor during the construction of the wall or roof.

13. No structural members shall be cut without the prior approval of the Owner's Representative. To gain approval to cut concrete, X-ray the affected area (or use another non-destructive method to examine the affected area) and submit results to Structural Engineer for review. Submit to Owner’s Representative, drawings and details for the support of structure around the opening. If the standard structural details are to be used, then submit a plan that cross-references all penetrations against detail numbers for review. Otherwise, submit drawings, design, and calculations stamped by a Registered Professional Structural Engineer in the state of New York. Any cutting and remedial support shall be done in a manner satisfactory to the Owner's Representative.

14. Where openings break into an existing wall, the Contractor shall provide lintels as required for the support of building construction above the opening. Lintels shall be structural steel angles, channels or tees of proper size and sections for the supported load. The Contractor shall submit structural load calculations to the Owner’s Representative signed and sealed by a professional engineer prior to installation.

15. The contractor shall bear the cost of time and materials for the Owner’s Representative to re-analyze the construction if the original penetration spacing principles are not adhered to, for whatever reason.

E. Cutting And Patching

1. Patching of building structure, walls, floors, etc. during normal work progress with Requirements of Section 01 33 00.
2. All patching or repair of damage to completed work in place shall be done to meet with the approval of the Owner's Representative.

3. Work in place that is subsequently cut is seen as evidence of the contractor’s lack of field coordination during the shop drawing production phase. Because field coordination is a requirement of the contract, the contractor must bear all costs of cutting, patching and repair for corrective work.

4. Assume responsibility for damage to any part of premises or Work of other Divisions, caused by leaks or breaks in piping or equipment furnished or installed under this Division during construction and guarantee/warranty period.

5. Provide sleeves, caps, plates, escutcheons, flashing, etc., required to fill or close the openings. Provide final grouting, concrete, asphalt, masonry, painting and other materials as required. Make repairs in like and kind for exact patching or surfaces and finishes.

6. Where cutting and patching occurs in streets, sidewalks, alleys and the like, cooperate fully with Owner’s Representative and municipal or other government bodies.

7. All patching shall be equal to the condition of the element prior to cutting as defined by the Owner’s Representative.

F. Coordination with Electrical Work

1. Division 26 Contractor: Wire all mechanical equipment furnished by this Division (excluding internal factory wiring) in accordance with the following general provisions:
   a. Provide 120-volt emergency power circuits available at panel for control contractor's use.
   b. Provide and wire heavy-duty, quick-make, quick-break type disconnect switches, manual pushbuttons and other fire alarm hard-wiring specifically called for in the documents or noted in electrical specifications and wherever required by Code. This excludes factory-mounted disconnects on equipment.
   c. Receive, unload, set, and rough align all separately shipped motors.
   d. Receive, unload, set and install all motor starters and variable frequency drives, except those clearly specified as an integral piece supported on the body of a piece of equipment.
   e. Wire all miscellaneous solenoid valves, relays and other components provided with equipment which is not factory wired or part of control contractor's scope.
   f. Wire lighting controls and other monitoring systems for interface with Building Management and Control System.
   g. Wire interlocks between equipment as called for in Controls specifications.
   h. Provide final equipment power connections for all equipment with voltage 110-volt and greater, including overcurrent protection and disconnect.
   i. Provide final equipment connections for all equipment that require motor starters. Include starter, overcurrent protection, and disconnect.
   j. Provide final connection to motorized smoke and fire-smoke dampers with voltage 110-volt and greater.
   k. Provide 120V wiring and conduit from dedicated J-box to Control Panels or controllers. Provide a disconnect switch for each final connection.

2. Division 23 shall provide the following:
   a. All motor starters and variable frequency drives or control devices called for to be factory prewired to mechanical equipment.
   b. All control devices noted on the drawings and within the specifications, including devices required to achieve Sequences of Operations but not explicitly mentioned or called out. Provide controls, controllers, relays, transformers, switches, etc. re-
required by Work of this Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC).

c. Complete and accurate wiring diagrams to Division 26 for all equipment requiring electrical power wiring.

d. Information for separately shipped motors and variable frequency drives to be installed by Division 26. Adjustable motor bases and all bolts and nuts required for installation of base and motor shall be provided and installed by Division 23.

e. Align and adjust mechanical coupling for direct-driven motorized equipment. Adjust and align drive and belt tension on belt-driven equipment.

f. Field lubricate all motors prior to operation and maintain lubrication prior to acceptance of equipment by the Owner's Representative.

g. Provide motor terminal connection diagram as prepared by motor manufacturers.

h. Provide low-voltage (less than 100V) control wiring from Control Panel or controller to controlled device.

i. Electrical work in this Division shall conform to the requirements of Division 26.

j. Provide controls relay for Building Automation System’s position monitoring of motorized smoke and fire-smoke dampers (in coordination with Division 28).

k. Equipment shall be ordered with factory-wired assemblies or panels, pre-wired to numbered terminal strips for connection to field wiring.

l. Provide weather-proof devices or protection for equipment outdoors, regardless of installing party.

m. Contractor to coordinate piping routing to ensure piping does not run above electrical equipment.

3. Division 28 Contractor: Wire all mechanical equipment furnished by this Division in accordance with the following provisions:

a. Product of combustion (duct smoke) detectors to be furnished under Division 28. Damper and duct smoke detectors to be installed by Division 23. Duct smoke detector to be wired by Division 28 to the fire alarm system.

b. Provide hard-wired air handling equipment shut-down relay connection as required by code.

c. Provide hard-wired connections for smoke control systems.

d. Provide hard-wired connections for control to all motorized smoke and fire-smoke dampers.

e. Provide fire alarm system position-monitor wiring for all motorized smoke and fire-smoke dampers.

f. Provide Fire Alarm location signals to the Building Management System, as applicable.

4. Where Drawings clearly and explicitly differ from the preceding wiring paragraphs, Drawings have precedence.

1.16 SUBMITTALS FOR PRODUCTS SPECIFIED IN THIS SECTION

A. Product Data: For the following:

13. Transition fittings.
15. Mechanical sleeve seals.
B. Welding certificates.
   1. The commissioning process requires Submittal review simultaneously with Engineering review.

PART 2 - PRODUCTS

2.1 GENERAL COMMENTS ON MATERIALS

A. Equipment specified by manufacturer’s number shall include all accessories, controls, etc., listed in catalog as standard with equipment. Furnish optional or additional accessories as specified.

B. Where no specific make of material or equipment is indicated, an RFI shall be submitted suggesting any first class product of reputable manufacturer selected at the Contractor’s discretion, provided it conforms to requirements of system.

C. All items of materials in each category of equipment shall be of one manufacturer.

D. Equipment shall be as described in the respective Sections of Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC) and as shown.

E. Design of mechanical systems is generally based on the product of one of the manufacturers cited. Where systems for product installed necessitate modification of systems shown on plans, Contractor is responsible for installation of systems appropriate to product installed.

2.2 MANUFACTURERS

A. In other Division 23 specifications, the following applies in Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified. The first manufacturer listed first represents the basis of design as scheduled and drawn in the Construction Documents.

PART 3 - EXECUTION

3.1 LOCAL AND EXISTING CONDITIONS

A. Prior to bidding, visit the site and determine all existing conditions affecting work in this Division and make adequate provisions in the bid proposal. Examine all Drawings and Specifications to familiarize with the type of construction to be used, and the nature and extent of work of other trades.

B. Observe the conditions under which deliveries of materials and equipment shall be made and under which such materials and equipment can be stored, and shall include adequate provision in the bid proposal.

C. Anticipate means of installing equipment through available openings in structure and make adequate provisions in the bid.
D. The location and elevation of the utilities, existing ductwork, piping, conduit, or equipment is that which can be determined from available information and its accuracy cannot be guaranteed. Exact location and elevation of these items shall be verified by the Contractor prior to excavation, demolition, or installation of any portion of the work indicated. Exercise special care when excavating at or near the general location of underground utilities to avoid damage to the utility services, as well as to ensure worker safety. Protect existing active services (water, gas, sewer, electric) when encountered, against damage from construction work. Do not prevent or disturb operation of active services which are to remain.

E. Any connections to or relocation of any existing utility line requiring temporary discontinuance of utility services which are in active use shall be scheduled and coordinated with the utility companies and the Owner's Representative at least 10 working days in advance. Provide description of disconnect, procedure to be done, and date/time duration of shutdown. The Work may require shutdowns to be accomplished on an “overtime” basis without additional cost to the Owner. Arrange work for continuous performance to assure that existing operating services will be shut down only during the time required to make necessary connections. If a system cannot shut down, install temporary bypasses or jumpers until connections are complete. In no case shall the services be left disconnected at the end of a working day or weekend unless authorized by representatives of the utilities and the Owner’s Representative. Any existing utility service damaged shall be repaired to the satisfaction of the Owner's Representative.

F. If existing active utility services are encountered which require relocation, make request proper authorities for determination of procedures. Properly terminate existing services to be abandoned in conformance with requirements of authorities having jurisdiction.

G. All removed equipment shall remain the property of the Owner and stored on site as directed.

H. Where connections or disruptions are made to existing system, reactive, refill and recharge all components and restore systems to the same operating conditions prior to the time of disruption.

I. Equipment Rough-In:
   1. Rough-in locations shown on Mechanical Drawings for equipment furnished by Owner and for equipment furnished under other Divisions are approximate only. Obtain exact rough-in locations from following sources:
      a. From Shop Drawings for Contractor furnished and installed equipment.
      b. From Architect for Owner furnished-Contractor installed equipment
      c. From existing equipment where such equipment is relocated under this Contract
   2. Verify mechanical characteristics of equipment before starting rough-in. Where conflict exists between equipment and rough-in shown on Drawings obtain clarification from Architect and provide as directed at no increase in Contract Sum.
   3. Make final connections.

3.2 FIELD VERIFICATION

A. All dimensions, locations of equipment and connections to utilities or pre-existing equipment shall be verified in field prior to construction and installation.
B. Architectural plans will hold precedence over mechanical plans as to location of partitions and diffusers.

C. Measurements in existing buildings shall take precedence over all other plans with regards to identifying location of existing installations.

D. All roughing in construction dimensions shall be made from architectural plans where discrepancies may exist. No change orders will be allowed for shifts in mechanical piping, ductwork, or equipment to match rough-in hole locations within 10 feet of original mechanical drawings.

E. Mechanical plans shall take precedence over electrical and plumbing plans with regards to placement of mechanical equipment and layout of electrical and plumbing equipment within rooms designated as “mechanical rooms.”

3.3 HOIST, RIGGING, TRANSPORTATION AND SCAFFOLDING

A. Provide all scaffolding, staging, cribbing, tackle hoist and rigging necessary for placing all materials and equipment in their proper places in the project. All temporary work shall be removed from the premises when its use is no longer required.

B. Prior to placing equipment or scaffolding, the contractor shall provide written verification that the structure on which the load is imposed has sufficient strength to accommodate the point and/or line loads.

3.4 PREVENTION AND RESTORATION OF DAMAGE

A. Protect premises and Work of other Divisions from damage arising out of installation of Work of this Division.

B. Perform Work in manner precluding unnecessary fire hazard.

C. Repair and replace work installed by this Division when it becomes damaged.
   1. Wetted insulation shall be considered damaged.
   2. Any NEM1 or NEMA2 motors for actuators that is wetted shall be considered damaged.
   3. Any metal showing evidence of rust, white rust, or other corrosion shall be considered damaged.
   4. Any caulking or adhesive which is observed to be flaking, delaminating or otherwise appearing to lose its bond shall be considered to be damaged, even if no evidence of actual leakage is as yet available.
   5. Any device or material exposed to fire or fire-generated smoke shall be considered damaged. This excludes localized use of controlled welding equipment for installation.
   6. Any device or material not in compliance with the Construction Documents shall be considered damaged.
   7. Ductwork, insulation and piping which shows evidence of denting, bending or compression greater than 1/8” deep shall be considered to be damaged. Any of these items showing evidence of having walked on will be considered damaged with replacement of the affected part and a 10’ length on either side of the main damaged area.
D. Repair or replace, as directed by Owner’s Representative, materials and parts of the Owner’s premises which become damaged as result of installation of Work of this Division. Remove replaced parts from premises.

E. Contractor shall be responsible for repair to work of all other Divisions caused by installation of the work of Division 23 or by leaks from piping or equipment furnished or installed under Division 23 during construction and guarantee/warranty period.

F. Where damage to another trades work occurs the Contractor shall pay the relevant trade contractor to make the repairs.

G. All repairs shall be equal to the condition of the element prior to cutting as defined by the Owner’s Representative.

H. Review of Construction
   1. Work may be reviewed at any time by the Owner’s Representative.
   2. Advise the Owner’s Representative that work is ready for review at following times:
      d. Prior to backfilling buried work
      e. Prior to concealment of work in walls and above ceilings.
      f. When an area or section of work is ready for punchlisting by the Owner’s Representative.
      g. When all requirements of Contract have been completed.
   3. Maintain on job a set of Specifications and Drawings for use by Owner’s Representatives.
   4. The Owner’s Representative will provide field observations of construction, will inform the Owner regarding progress and problems related to construction, and will endeavor to guard the Owner against defective materials and faulty workmanship. Field observations will be periodic depending upon nature of construction. The Owner’s Representative does not perform an extensive or continuous inspection, is not responsible for execution of Contract Documents by Contractor, and is not responsible for construction methods, sequences, or safety precautions.

3.5 TOOLS AND EQUIPMENT

A. Furnish all tools and equipment necessary for the proper installation, protection and upkeep of the work.

B. Furnish to Owner the following:
   1. One set of any special tools required to operate, adjust, dismantle or repair any equipment of this Division. “Special Tools” means those not normally found in possession of mechanics or maintenance personnel.
   2. One pressure grease gun for each type of grease required, complete with adaptors to fit all lubricating fittings on equipment.

3.6 EXCAVATION, TRENCHING AND BACKFILL

A. Provide barricades, signs, lanterns, shoring, sheeting and pumping as part of Work in this Division as required to insure safe conditions. Comply with OSHA requirements.
B. Shore all trenches and excavations as necessary to maintain the banks of excavations and to prevent any sloughing, caving-in or damage of any kind.

C. Perform all excavations, trenching, and backfill required to complete the work in this Division, regardless of the character of the materials encountered or the method of excavation required.

D. All excavations shall be inspected by the Owner's Representative and approved before placing of any pipe, conduit or duct.

E. Subject to the requirements of the civil engineer, dig trenches straight, true to line and grade with sides and bottoms smoothed of any rock points. Excavate 6 inches below grade of pipe, fill with sand properly packed. Support pipe for entire length on packed sand. Shape of pack bottom of trenches for pipe, duct fittings, hubs, couplings, etc., using templates to fit outside periphery of lower third of piping and ductwork. Provide piping outside building with 36 inch minimum cover from top of pipe to finished grade. Minimum width 16 inches.

F. All pipe, duct or conduit installation shall be inspected by the Owner’s Representative and the Authority Having Jurisdiction prior to backfill.

G. Pumping equipment shall be provided as necessary to keep trenches free from standing water. All shoring necessary to maintain the banks of excavations and to prevent any sloughing or caving-in, and as necessary to prevent damage of any kind which may occur in connection with this work shall be furnished and installed by the Contractor.

H. In any asphalt or concrete paved areas, backfill only to subgrade level, as coordinated with Division 31 Contractor.

I. Utility trenching shall comply with individual utility company requirements.

J. Any imported backfill material required shall be approved by the soils engineer responsible for certification of compaction.

3.7 INSTALLATION

A. Install equipment according to the manufacturer’s instructions, code requirements, and required access clearances.

B. Equipment Installation

1. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

2. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

3. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

4. Install equipment to allow right of way for piping installed at required slope.

5. Assemble equipment which is required to be field assembled under the direct supervision of the manufacturer’s agent. Prior to the final acceptance submit letters from the manufacturers that this has been done.
6. Accurately set and level with supports neatly placed and properly fastened. Properly fasten equipment in place with bolts to prevent movement in earthquake. No allowance of any kind will be made for negligence on part of Contractor to foresee means of bringing in, installing equipment into position inside building.

C. Vibration and Seismic Control
   1. Coordinate with Division 1.
   2. Design criteria and extent of bracing, anchorage, supports etc., for all the Work of Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC) are specified in Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment and Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

D. Hangers, Inserts, Supports and Bases
   1. Provide required structural members, hangers, supports and inserts to keep piping and conduit in proper alignment and prevent transmission of injurious thrusts and vibrations. Where supported from concrete construction, do not weaken concrete or post-tension strands or penetrate waterproofing. Hangers and supports shall be finally adjusted in vertical and horizontal direction under operating conditions.
   2. Metal deck roof systems shall not be used for the support of hangers, inserts, etc.
   3. Support equipment and other mechanical items on curbs, legs or steel framework. Provide all metal bases and supports, not part of the building structure, unless specifically indicated to be provided under this Division shall be as described for similar work under other Division. Materials and equipment furnished or provided under this Division shall be as described for similar work under other Division. Concrete, masonry and wood bases and supports shall be provided under other division of this Specification. Furnish required foundation sizes, bolts, washers, sleeves, plates, templates, etc., for mechanical equipment provided.
   4. Coordinate inserts with Division 3 prior to pouring of concrete. In the infrequent event that an insert is dislodged or misplaced, provide a request for information that includes a precisely dimensioned drawing and a ferroscan of that area for Owner’s Representative to review for potential expansion anchor drill locations.

E. Equipment Rough-In
   1. Rough-in locations shown on Mechanical Drawings for equipment furnished by Owner and for equipment furnished under other Divisions are approximate only. Obtain exact rough-in locations from following sources:
      h. From Shop Drawings for Contractor furnished and installed equipment.
      i. From Architect for Owner furnished-Contractor installed equipment.
      j. From existing equipment where such equipment is relocated under this Contract.
   2. Verify mechanical characteristics of equipment before starting rough-in. Where conflict exists between equipment and rough-in shown on Drawings obtain clarification from Architect and provide as directed at no increase in Contract Sum.
   3. Make final connections.

F. Concrete Pad
1. Anchor equipment to concrete pad according to equipment manufacturer's written instructions and according to seismic codes at Project.

2. Construct concrete pads of dimensions indicated, but not less than 4 inches (100 mm) high and extending 6 inches (150mm) beyond edge of the supported unit.

3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.

4. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

5. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

6. Install anchor bolts to elevations required for proper attachment to supported equipment.

7. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

8. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement.

G. Grout

1. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   b. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

2. Packaging: Premixed and factory packaged.

3. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
   a. Clean surfaces that will come into contact with grout.
   b. Provide forms as required for placement of grout.
   c. Avoid air entrapment during placement of grout.
   d. Place grout, completely filling equipment bases.
   e. Place grout on concrete bases and provide smooth bearing surface for equipment.
   f. Place grout around anchors.
   g. Cure placed grout.

H. Access Panels

1. Place no valves, traps, controls, unions, dampers, coils, air distribution boxes, cleanouts, junction boxes, pull boxes, expansion joints, etc., in any system at a location that will be inaccessible after construction is completed. Maintain accessibility for all components in systems.

2. Furnish all access doors required for all items located above finished ceilings, ceiling breaks or extensions behind finished walls or below finished floor, even though access doors may not be shown with the documents of this Division. Mark each door with a hidden identification tag cross-referenced to a plan location to ease installation by others.

3. Furnish access door and panel types to ensure the same manufacturer for identical appearance and keying.

4. Sizes: 12 by 12 inches for easily accessible items within 6 inches behind walls; 18 by 18 inches where partial body access is required; 24 by 24 inches at ceilings or where entire body access is necessary.

I. All work shall be performed by licensed contractors skilled in their respective trades.
3.8 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

3.9 START UP AND FIELD ADJUSTMENT

A. Startup Service:
   1. Prior to startup, ensure that systems are ready, including checking the following: Proper equipment rotation, proper wiring, auxiliary connections, lubrications, venting fan balance, controls and installed properly set relief and safety valves.
   2. Start and operate all systems. Provide services of factory trained technicians for startup of major equipment and systems including boilers, fire pumps, etc.

B. Contractor shall be responsible to change or adjust belts, drives, pulleys, motors, impellers, as required by balancing company to achieve the desired air and water delivery in an energy efficient manor by all air handling equipment, fans and pumps. Refer to Section 23 05 93.

3.10 OPERATION BY OWNER

A. Owner may require operation of parts or all of respective installations prior to final acceptance. Cost of utilities for such operation shall be paid by Owner.
B. Operation of installation shall not be construed as acceptance of Work.

3.11 TESTING

A. Labor, materials, instruments and power required for testing provided under respective Sections for Work under that Section. Test all systems as specified under various applicable Section. Duration of tests shall be determined by the authority having jurisdiction and in no case less than the time specified.

B. Test shall be performed to the satisfaction of the Owner’s Representative and regulating authority having jurisdiction. Submit written certificates that tests have been performed in accordance with Specification requirements.

C. Repair or replace defective Work and repeat tests until particular systems, and component parts thereof, receive approval of Architect and regulating authority. Any damages resulting from tests shall be repaired and damaged material replaced, all satisfaction of Architect and at no cost to Owner.

D. Tests shall be performed on individual equipment, systems and their controls. Whenever the equipment or system under test is inter-related with, and depends upon, the operation of other equipment or systems and their controls for proper operation, functioning, and performance, the latter shall be operating simultaneously with equipment or system being tested.

E. Testing, adjusting and balancing of air and hydronic is specified under Section 23 05 93.

F. Pressure test piping before connection to equipment as required under Sections 23 21 13 and 23 22 13. No piping equipment or accessories shall be subjected to pressures exceeding their rating.

G. No piping shall be closed up, furred in, or covered before testing. Notify regulating authority and Owner’s Representative with advanced notice as noted in Sections 23 21 13 and 23 22 13.

H. Drain water used for testing from the system after tests are complete. Repair or replace any damage caused by freezing of water left in system at no expense to the Owner.

I. Equipment and systems which normally operate during certain seasons of year shall be tested during the appropriate season.

J. After completion of testing and adjustment, operate the different systems and equipment under normal working conditions for 72 hours continuously and show specified performance. If, in the opinion of the Architect, performance of equipment or systems is not in accordance with specifications or submitted data, alter or replace equipment at no increase in Contract Sum. Contractor, at his opinion, may order tests from an independent approved laboratory to prove compliance. All such tests shall be at no increase in Contract Sum. Repeat process as often as required.

K. At completion of Work, provide written certification that all systems are functioning properly without defects.
3.12 PAINTING

A. All unpainted, non-insulated, non-galvanized, ferrous metal surfaces of pipes, equipment, fixtures, hangers, supports, and accessories painted under Section 09 90 00 - Painting and Coating.

B. Properly prepare Work under this Division to be finish painted under Section 09 90 00 - Painting and Coating.

C. Refinish Work supplied with final finish under this Division if damaged under this Division to satisfaction of Architect.

D. Provide moisture resistant paint for exterior painting and heat resisting paint for hot piping, equipment and materials.

E. Provide colors as directed by Architect unless specified otherwise.

F. Provide factory finishes as noted in the individual Equipment Sections.

G. For the following, provide factory prime coat.
   1. Air outlets: identified within relevant Section to be painted to match adjacent mounting surfaces.

H. Paint all equipment out-of-doors and equipment supports with two coats of weather resistant enamel.

3.13 CLEANING

A. At all times keep the premises free from accumulation of waste material and debris caused by his employees. At the completion of the project, and at other times as Architect may direct, remove refuse from within and around the building. All tools, scaffolding and surplus materials shall also be removed, leaving the Site of his Work clean.

B. The Work of each Section includes removing tools, scaffolding, surplus materials, barricades, temporary walks, debris and rubbish from the Project promptly upon completion of that portion of the Work. Leave the area of operations completely clean and free of these items.

C. Clean premises of all excess construction material and debris caused by work.

D. During the course of construction, cap all ducts, pipe and electrical conduit in approved manner to ensure adequate protection against entrance of foreign substances.

E. Disconnect, clean and reconnect, whenever necessary, to locate and remove obstructions from any system. Repair or replace any Work damaged in the course of removing said obstructions at no additional cost to the Owner.

F. Clean ductwork inside and out before grilles are installed and before fans are operated.

G. Surfaces shall be left clean, debris shall be removed, and equipment shall be furnished in prime coat finish unless otherwise specified.
H. Clean exterior of piping, ductwork and equipment, exposed in complete structure. Remove rust, paint overspray, fireproofing overspray, plaster and dirt by wire brushing; remove grease, oil and similar materials by wiping with clean rags and suitable solvents.

I. Motors, Pumps, Air Moving Equipment and Other Items with Factory Finish: Remove grease, oil, paint overspray, fireproofing overspray, gypsum board mudsplatters and leave surfaces clean.

### 3.14 LUBRICATION

A. Lubricate all equipment at completion of Work. Furnish Owner with a written lubrication schedule for all equipment.

B. Extend grease fittings on all bearings to points of ready and easy accessibility.

C. Lubricate, as required, all motor and fan bearings, etc., before operation of any equipment.

D. Provide a final lubrication to all equipment requiring same immediately before turning over to Owner.

### 3.15 FINAL INSPECTION

A. The Contractor shall arrange for the all AHJ’s to make final inspections and correct all defects identified.

B. Prior to substantial completion the Contractor shall verify that the work is complete and that all incidental defects identified by the Architect/Engineer during construction have been corrected.

C. As the work nears completion, review the requirements of the Contract Documents, inspect the work and inform all parties involved in work to be corrected or completed before the project can be deemed substantially complete.

D. When the project is substantially complete, notify the Owner's Representative in writing of this fact, listing those items of work remaining incomplete, the reason for incompleteness, and the anticipated date that all remaining work will be completed. Carry out own final inspection and be satisfied that the work is complete. Final inspection of the project will then be scheduled by the Owner's Representative.

E. The Owner's Representative reserves the right to cancel and reschedule the inspection in the event considerable more work remains to be completed or corrected than indicated in the written request for inspection.

F. All items not completed or found not complying with drawings or specifications by the Owner's Representative will be identified in an inspection report by Owner's Representative.

G. Correct all items on inspection report. Make the correction and initial and date each item on the report after corrections have been completed.

H. Verify that all defective work has been corrected before offering the system for re-inspection.
3.16 PROJECT CLOSE-OUT

A. Prior to requesting Owner's Representative's inspection for certification of substantial completion, complete the following and list known exceptions in request:

1. Obtain final inspections and approvals from all governmental jurisdictions that are required for the project.
2. Submit record drawings, maintenance manuals, warranties, and similar final record information.
3. Deliver tools, spare parts, extra stocks of materials, and similar physical items to the Owner.
4. Complete start-up, testing and demonstration of systems to the satisfaction of the Owner's Representative that the entire installation is complete, properly adjusted and is in proper operating condition.
5. Complete final cleaning requirements.
6. Complete all training requirements for Owner’s Staff.
7. Complete the Commissioning process.

END OF SECTION 230500
SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION
A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS
A. Comply with NEMA MG 1 unless otherwise indicated.
B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS
A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 0 feet above sea level.
B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.
   1. For motors with 2:1 speed ratio, consequent pole, single winding.
   2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:
   1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
   2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
   3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
   4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513
SECTION 230517
SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary
      Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section Includes:
      1. Sleeves.
      2. Stack-sleeve fittings.
      3. Sleeve-seal systems.
      4. Sleeve-seal fittings.
      5. Grout.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES
   A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron
      pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
   B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded
      steel collar; zinc coated.
   C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc
      coated, with plain ends.

2.2 STACK-SLEEVE FITTINGS
   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:
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
3. Or approved equal.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
   1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

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. Metraflex Company (The).
   2. Pipeline Seal and Insulator, Inc.
   3. Or approved equal.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
   1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   2. Pressure Plates: Stainless steel.
   3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

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. Presealed Systems.
   2. Or approved equal.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT


B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.
PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
   1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
   1. Permanent sleeves are not required for holes in slabs formed by molded-PE or PP sleeves.
   2. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
   3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
   1. Cut sleeves to length for mounting flush with both surfaces.
   2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.
   1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
   3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION
A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION
A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
C. Secure nailing flanges to concrete forms.
D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE
A. Use sleeves and sleeve seals for the following piping-penetration applications:
   1. Exterior Concrete Walls above Grade:
   2. Interior Partitions:

END OF SECTION 230517
SECTION 230529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment supports.

B. Related Sections:
   1. Section 230548.13 "Vibration Controls for HVAC" for vibration isolation devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: **Signed and sealed by a qualified professional engineer.** Show fabrication and installation details and include calculations for the following; include Product Data for components:
   1. Trapeze pipe hangers.
   2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Detail fabrication and assembly of trapeze hangers.
   2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   5. Hanger Rods: Continuous-thread rod, nuts, and washer made of **carbon steel**.
B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel or stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

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. Carpenter & Paterson, Inc.
3. ERICO International Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.
10. Or approved equal.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
2.4 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.


H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS
   A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
   B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
   C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS
   A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
   B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
   C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING
   A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
   B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING
   A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
      1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 3.
2. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 3.
3. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
4. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
5. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 3, from two rods if longitudinal movement caused by expansion and contraction might occur.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.
   c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Refer to specification section 230548.13 – Vibration control for HVAC.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Use **mechanical-expansion anchors** instead of building attachments where required in concrete construction.
END OF SECTION 230529
SECTION 230548.13
VIBRATION CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section Includes:
   1. Elastomeric isolation pads.
   2. Elastomeric isolation mounts.
   3. Restrained elastomeric isolation mounts.
   4. Open-spring isolators.
   5. Housed-spring isolators.
   6. Restrained-spring isolators.
   8. Resilient pipe guides.
   10. Restrained-air-spring isolators.
   11. Elastomeric hangers.
   12. Spring hangers.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.
B. Shop Drawings:
   1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
   2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
C. Delegated-Design Submittal: For each vibration isolation device.
   1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For testing agency.

C. Welding certificates.

D. Air-Mounting System Performance Certification: Include natural frequency, load, and damping test data performed by an independent agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-spring mounts and restrained-air-spring mounts to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable Manufacturers:
   a. Mason Industries, Inc
   b. Kinetics Noise Control
   c. Vibration Mountings and Controls

B. General
   1. Isolators shall be selected by the supplier, even if sizing is shown. Size vibration isolators on single piece of equipment for equal static deflections based on actual static and dynamic weight distribution per point of support furnished by equipment manufacturer. Dynamic loads include those due to wind, fluid flow, thrust and rotations inertial. Select
each isolator independently for the load distribution on the equipment base, duct or pipe support.

2. In determining weight of equipment, include concrete inertia bases, grout filled pump bases, etc., where relevant.

3. All static deflections are nominal. Actual installed deflections shall be +15 percent of the specified value. Where static deflections are not specified, provide minimum 2 inch deflection for rotating and reciprocating equipment.

4. Use as few isolators on equipment as practical. For example, 4 isolators on small equipment and inertia bases.

5. Vibration isolators shall have either known height without a load or other markings so that after adjustment, when fully loaded, the deflection can be verified.

6. Incorporate a resilient neoprene element of 1/4-inch minimum thickness on spring hangers to prevent solid contact between the spring and isolator housing.

7. Install thrust restraints on fans over 3 inches wg static pressure with the same deflection as isolators supporting the fan.

8. All spring isolators laterally stable with leveling bolts. Spring isolators minimum additional "travel" to full compression of half the rated deflection. The ratio of lateral to vertical stiffness shall be 0.9 minimum and 1.5 maximum.

9. Provide all floor-mounted spring isolators with mounting base plates that provide for bolting to the floor and incorporate 1/2-inch thick neoprene bearing pads.

10. Provide EPDM or equal elastomeric elements in place of neoprene on all vibration isolators installed outdoors.

11. Provide neoprene material with anti-ozone and anti-oxidant additives.

12. Supply all miscellaneous steel to make support compatible with equipment.

13. Mount motors on rigid base common with equipment or supported from equipment frame.

14. Snubbers shall not limit vibration isolation capability during normal operation. Where steel limit stops are used, provide 3/4-inch thick neoprene to prevent metal-to-metal impact.

15. Vibration isolation manufacturer’s representative shall supervise and inspect all installed isolation hardware and generate punchlist for the Construction Manager, along with corrective measures required. Submit inspection report.

C. Description
Isolator types: Type of mounting and supporting base and minimum static deflection, as scheduled and required. Mason model numbers used.

2. Base mounts:

a. **Type NP**: Neoprene pad. Waffle, ribbed, or other forms. Typically 3/4-inch thick. Durometers of 40 to 50. Static deflections from 0.125 inch. Provide steel load distribution plates. Size of pad to be specified by isolator supplier based on load per point. Provide grommeted bolt when anchoring. Mason "Super" W and WM.

b. **Type NM**: Neoprene mounts. Molded one-piece assemblies with skid resistant base plates and mounting holes. Double deflection type with static deflection range from 0.3 to 0.5 inch. Coat metal surfaces with neoprene to prevent corrosion. Provide friction pad. Mason ND.

c. **Type USM**: Unhoused spring mounts. Single or multiple bare steel springs, baseplates with neoprene pad. Height saving mounting brackets where applicable, height adjustment bolts. Static deflection range from 1.0 to 5.0 inches nominal. Mason SLF.

3. Hangers:

a. **Type NH**: Neoprene hangers. Molded neoprene units in a steel hanger frame. Double deflection types with static deflection range from 0.3 to 0.5 inch. Designed to preclude contact of hanger rods with frame (30 degrees misalignment). Insert neoprene bushing where rod passes through housing. Mason HD.

b. **Type SH**: Hanger containing spring in series with deflected neoprene element, load transfer. Same as Type NH with yoke assembly and indicator for load transfer seat spring in neoprene cup with washer to distribute load evenly to cup and to prevent spring-to-casing contact. Mason PC 30N.

4. Resilient attachments:

a. **Type RA-1**: 3/4-inch nominal thickness resilient pipe sleeve between pipe and clamp or hanger.

   1) Operating temperature at or below 80 degrees F, except in plenums: Armstrong Armaflex, Manville Aerotube or approved equal.

   2) Operating temperature above 80 degrees F or in plenums: preformed glass fiber pipe insulation not exceeding 6 pcf.

b. **Type RA-2**: Manufactured insulated hanger for uninsulated pipe: Superstrut P/A-716 Cush-A-Clamp, Unistrut, B-line or approved equal.

c. **Type RA-3**: Manufacturer resilient attachment for water pipes 1 inch and less diameter: Technical Specialties Acousto-Plumb System (orange and blue).
5. Other Supports:
   
a. **Type T**: Trapeze. Supporting sling of steel member with vibration isolation mount or hangers at each end. Used to distribute load or to conserve space.

b. **Type S**: Stanchion support. A supporting arm or system for equipment or piping between the isolator and load.

c. Type "cable" seismic restraints shall be constructed of 7 x 19 strand galvanized aircraft cable. Cable assembly shall come compete with two "U" bolt clamps per end. Allowed loads shall contain a safety factor of three when worse-case loading applied to one cable. Cable shall be installed with 1/4-inch slack to prevent the transmission of vibration to the structure.

6. Flexible Connections
   
a. Pipework flexible connections shall be manufactured of multiple plies of nylon tire cord fabric and neoprene both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement. Straight connectors shall have two spheres. Connectors up to and including 1-1/2" diameter may have threaded ends. Connectors 2" and larger shall be manufactured with floating galvanized flanges recessed to lock the connector's raised face neoprene flanges. Hoses shall be installed on the equipment side of the shut valves.

b. Connectors shall be rated a minimum of 150 psi at 220°F.

c. Elbows shall be Mason-Flex type MFNEC, straight connectors Mason-Flex type MFTFU or MFTNC, and control cable assemblies type ACC, all as manufactured by Mason Industries, Inc.

d. Where system pressure and temperature exclude the use of rubber flexible connections, use flexible metallic hose. Flexible metallic hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples. Lengths shall be as tabulated:

<table>
<thead>
<tr>
<th>Male Nipples</th>
<th>Flanged</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 x 9</td>
<td>1-1/2 x 13</td>
</tr>
<tr>
<td>3/4 x 10</td>
<td>2 x 14</td>
</tr>
<tr>
<td>1 x 11</td>
<td>2-1/2&quot; x 18</td>
</tr>
<tr>
<td>1-1/4 x 12</td>
<td>6 x 20</td>
</tr>
<tr>
<td></td>
<td>8 x 22</td>
</tr>
</tbody>
</table>

D. Electrical Connections to Resiliently Mounted Equipment
1. Make electrical connections to equipment which is supported or suspended by vibration isolators with long lengths of flexible steel conduit (no less than 24”), depending on environment. Locate these flexible connections so as to prevent rigid connections between the resiliently mounted equipment and the building structure.

PART 3 - EXECUTION

3.1 INSTALLATION

E. General:

1. Install vibration isolation equipment in full accordance with the manufacturer's instructions.

2. Suspend the vibration isolators supporting piping, ductwork and equipment from structural members.

3. Provide a minimum of 1 inch clearance between the building structure and vibration isolated supports, ducts, pipes, and equipment.

4. Fasten all vibration isolators to the structure, not to floor diaphragms or lightweight components. Use bolts where holes are provided in the mounting flanges; otherwise, adhere using structural adhesive. Where mounting flanges are steel, use neoprene grommets and washers under anchor bolts. Where vibrating elements are to be fastened to structural elements provide connection details for review by Architect.

5. Do not use vibration isolation components to straighten or connect misaligned sections of piping or ductwork.

6. Align spring isolation hanger rods to clear the hanger box under all operating conditions.

7. Any bracing or supports for mechanical ductwork, piping, and equipment shall not bridge or reduce the effectiveness of vibration isolators.

8. Level vibration isolated equipment under rated design operating conditions while maintaining the isolation criteria. Isolators shall be plumb and aligned to preclude misalignment or undesired contact during operation.

F. Vibration Isolation Schedule:
### Equipment Vibration Controls

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Deflection</th>
<th>Isolator Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fans</td>
<td>2.0&quot;</td>
<td>SH or USM</td>
</tr>
<tr>
<td>Compressors less than 5 hp</td>
<td>0.5&quot;</td>
<td>NM</td>
</tr>
<tr>
<td>Other small pumps and motors (incl. inline pumps)</td>
<td>0.5&quot;</td>
<td>NM</td>
</tr>
<tr>
<td>Wall and exhaust fans less than ¼ hp</td>
<td>0.5&quot;</td>
<td>NH or NM</td>
</tr>
<tr>
<td>All process and passive equipment attached to pump systems</td>
<td>0.5&quot;</td>
<td>NM</td>
</tr>
</tbody>
</table>

### Piping and Ductwork:

1. All piping less than 2” shall be vibration isolated using a resilient attachment, type RA-3.
2. Use trapezes for vertical support to horizontal piping only. Brace trapeze with an OSHPD pre-approved bracing system, or provide calculations demonstrating compliance with regulatory requirements.
3. No electrical conduit, fixture, ceiling suspension wires or other elements of the building construction attached to or abutted against the duct and piping systems.
4. Where ducts or piping penetrate walls, ceilings and floors of the occupied spaces, or ceiling void partitions or acoustically rated elements whether shown on the drawings or not, acoustically seal the penetration. See detail specified herein.
5. Contain rough-in of piping within stud wall cavities no less than 1/4-inch from the plane of the studs and 1 inch from gypsum board or other wall sheathing.
6. Install flexible connections at all connections to vibration isolated equipment, rotating, reciprocating and other vibrating equipment, and all pumps, whether isolated or not and at all air handlers whether internally isolated or not.
7. Vibration isolate all pipes except vents, gas and fire protection lines. Do not allow piping, plumbing or vent stacks to contact gypsum board.
8. Do not suspend plumbing or piping from ducts, conduits or related supports.
10. Do not suspend ducts from piping, plumbing, conduits or related supports.
11. When equipment is in full operational condition, adjust the mounts to ensure that the equipment is free floating, level and stable.
12. All equipment mounted on anti vibration mounts shall be connected to the adjacent ductwork or pipework system via a flexible connection positioned to avoid a direct connection between equipment and mounting surface.

13. Flanged equipment shall be directly connected to neoprene elbows in the size range 2-1/2" through 12" if the piping makes a 90° turn at the equipment. All straight through connections shall be made with twin-spheres properly pre-extended as recommended by the manufacturer to prevent additional elongation under pressure. 12" and larger sizes operating above 100 psi shall employ control cables with end fittings isolated by means of 1/2" thick bridge bearing neoprene washer bushings designed for maximum of 1000 psi.

END OF SECTION 230548.13
SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
   a. Constant-volume air systems.
   b. Dual-duct systems.
   c. Variable-air-volume systems.
   d. Multizone systems.
   e. Induction-unit systems.

2. Balancing Hydronic Piping Systems:
   a. Constant-flow hydronic systems.
   b. Variable-flow hydronic systems.
   c. Primary-secondary hydronic systems.

3. Balancing steam systems.

4. Testing, Adjusting, and Balancing Equipment:
   a. Heat exchangers.
   b. Motors.
   c. Chillers.
   d. Cooling towers.
   e. Condensing units.
   f. Boilers.
   g. Heat-transfer coils.

5. Testing, adjusting, and balancing existing systems and equipment.

6. Sound tests.

7. Vibration tests.

8. Duct leakage tests.

9. Control system verification.
1.3 DEFINITIONS
B. BAS: Building automation systems.
D. TAB: Testing, adjusting, and balancing.
F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
G. TDH: Total dynamic head.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in “Quality Assurance” Article.
D. Certified TAB reports.
E. Sample report forms.
F. Instrument calibration reports, to include the following:
   1. Instrument type and make.
   2. Serial number.
   3. Application.
   4. Dates of use.
   5. Dates of calibration.

1.5 QUALITY ASSURANCE
A. TAB Specialists Qualifications: Certified by AABC.
   1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
   2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.
B. TAB Specialists Qualifications: Certified by AABC, NEBB or TABB.
   1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC, NEBB or TABB.
   2. TAB Technician: Employee of the TAB specialist and certified by AABC, NEBB or TABB as a TAB technician.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
1. Airside:
   a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
   b. Duct systems are complete with terminals installed.
   c. Volume, smoke, and fire dampers are open and functional.
   d. Clean filters are installed.
   e. Fans are operating, free of vibration, and rotating in correct direction.
   f. Variable-frequency controllers' startup is complete and safeties are verified.
   g. Automatic temperature-control systems are operational.
   h. Ceilings are installed.
   i. Windows and doors are installed.
   j. Suitable access to balancing devices and equipment is provided.

2. Hydronics:
   a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
   b. Piping is complete with terminals installed.
   c. Water treatment is complete.
   d. Systems are flushed, filled, and air purged.
   e. Strainers are pulled and cleaned.
   f. Control valves are functioning per the sequence of operation.
   g. Shutoff and balance valves have been verified to be 100 percent open.
   h. Pumps are started and proper rotation is verified.
   i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
   j. Variable-frequency controllers' startup is complete and safeties are verified.
   k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111 NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
   1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
   2. After testing and balancing, install test ports and duct access doors.
   3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish to Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
D. Take and report testing and balancing measurements in [inch-pound (IP)] [and] [metric (SI)] units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.
   a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
   b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
   c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
   d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
2. Measure fan static pressures as follows:
   
a. Measure static pressure directly at the fan outlet or through the flexible connection.
b. Measure static pressure directly at the fan inlet or through the flexible connection.
c. Measure static pressure across each component that makes up the air-handling system.
d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

   1. Measure airflow of submain and branch ducts.
   2. Adjust submain and branch duct volume dampers for specified airflow.
   3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

   1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
   2. Measure inlets and outlets airflow.
   3. Adjust each inlet and outlet for specified airflow.
   4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

   1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
   2. Re-measure and confirm that total airflow is within design.
   3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
   4. Mark all final settings.
   5. Test system in economizer mode. Verify proper operation and adjust if necessary.
   6. Measure and record all operating data.
   7. Record final fan-performance data.

3.6 PROCEDURES FOR DUAL-DUCT SYSTEMS

A. Adjust the dual-duct systems as follows:
1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge. On systems with separate hot-deck and cold-deck fans, verify the location of the sensor on each deck.

2. Verify that the system is under static pressure control.

3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.

4. Calibrate and balance each terminal unit's hot deck and cold deck for maximum and minimum design airflow as follows:

   a. Adjust controls so that terminal is calling for full cooling. Some controllers require starting with minimum set point. Verify calibration procedure for specific project.

   b. Measure airflow and adjust calibration factors as required for design cold-deck maximum airflow and hot-deck minimum airflow. Record calibration factors.

   c. When maximum airflow is correct, balance the air outlets downstream from terminal units.

   d. Adjust controls so that terminal is calling for full heating.

   e. Measure airflow and adjust calibration factors as required for design cold-deck minimum airflow and hot-deck maximum airflow. Record calibration factors. If no minimum calibration is available, note any deviation from design airflow.

5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.

   a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.

   b. Set terminals for maximum airflow. If system design includes diversity (cooling coil or fan), adjust terminals for maximum and minimum airflow so that connected total matches cooling coil or fan selection and simulates actual load in the building. In systems with separate hot-deck and cold-deck fans, diversity consideration applies to each individual fan.

   c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.

   d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

   e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

6. Measure the fan(s) static pressures as follows:

   a. Measure static pressure directly at the fan outlet or through the flexible connection.

   b. Measure static pressure directly at the fan inlet or through the flexible connection.

   c. Measure static pressure across each component that makes up the air-handling system.

   d. Report any artificial loading of filters at the time static pressures are measured.
7. Set final return and outside airflow to the fan(s) while operating at maximum return airflow and minimum outdoor airflow.
   a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
   b. Verify that all terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.

9. Verify final system conditions as follows:
   a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
   b. Re-measure and confirm that total airflow is within design.
   c. Re-measure final fan operating data, rpms, volts, amps and static profile.
   d. Mark final settings.
   e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
   f. Verify tracking between supply and return fans.

10. Record final fan-performance data.

3.7 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:

   1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
   2. Verify that the system is under static pressure control.
   3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
   4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:
      a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
      b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
      c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
      d. Adjust controls so that terminal is calling for minimum airflow.
e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
f. When in full cooling or full heating, ensure that there is no mixing of hot-deck and cold-deck airstreams unless so designed.
g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.

5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
   a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
   b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
   c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
   d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
   e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

6. Measure fan static pressures as follows:
   a. Measure static pressure directly at the fan outlet or through the flexible connection.
   b. Measure static pressure directly at the fan inlet or through the flexible connection.
   c. Measure static pressure across each component that makes up the air-handling system.
   d. Report any artificial loading of filters at the time static pressures are measured.

7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
   a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
   b. Verify that terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.

9. Verify final system conditions as follows:
   a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
   b. Re-measure and confirm that total airflow is within design.
   c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
   d. Mark final settings.
e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
f. Verify tracking between supply and return fans.

3.8 PROCEDURES FOR MULTIZONE SYSTEMS

A. Position the unit's automatic zone dampers for maximum flow through the cooling coil.

B. The procedures for multizone systems will utilize the zone balancing dampers to achieve the indicated airflow within the zone.

C. After balancing, place the unit's automatic zone dampers for maximum heating flow. Retest zone airflows and record any variances.

D. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

   1. Measure total airflow.
      a. Set outside-air, return-air and relief-air dampers for proper position that simulates minimum outdoor air conditions.
      b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
      c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
      d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

   2. Measure fan static pressures as follows:
      a. Measure static pressure directly at the fan outlet or through the flexible connection.
      b. Measure static pressure directly at the fan inlet or through the flexible connection.
      c. Measure static pressure across each component that makes up the air-handling system.
      d. Report artificial loading of filters at the time static pressures are measured.

   3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

   4. Obtain approval from [Architect] [Owner] [Construction Manager] [commissioning authority] for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

   5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
E. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
   1. Measure airflow of submain and branch ducts.
   2. Adjust submain and branch duct volume dampers for specified airflow.
   3. Re-measure each submain and branch duct after all have been adjusted.

F. Adjust air inlets and outlets for each space to indicated airflows.
   1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
   2. Measure inlets and outlets airflow.
   3. Adjust each inlet and outlet for specified airflow.
   4. Re-measure each inlet and outlet after they have been adjusted.

G. Verify final system conditions.
   1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
   2. Re-measure and confirm that total airflow is within design.
   3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
   4. Mark all final settings.
   5. Test system in economizer mode. Verify proper operation and adjust if necessary.
   6. Measure and record all operating data.
   7. Record final fan-performance data.

3.9 PROCEDURES FOR INDUCTION-UNIT SYSTEMS

A. Balance primary-air risers by measuring static pressure at the nozzles of the top and bottom units of each riser to determine which risers must be throttled. Adjust risers to indicated airflow within specified tolerances.

B. Adjust each induction unit.

C. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure total airflow.
      a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
      b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
      c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
      d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
   2. Measure fan static pressures as follows:
a. Measure static pressure directly at the fan outlet or through the flexible connection.
b. Measure static pressure directly at the fan inlet or through the flexible connection.
c. Measure static pressure across each component that makes up the air-handling system.
d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

4. Obtain approval from [Architect] [Owner] [Construction Manager] [commissioning authority] for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

D. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

E. Balance airflow to each induction unit by measuring the nozzle pressure and comparing it to the manufacturer's published data for nozzle pressure versus cfm. Adjust the unit's inlet damper to achieve the required nozzle pressure for design cfm.

F. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.10 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.
C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check liquid level in expansion tank.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
5. Verify that motor starters are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

3.11 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Adjust pumps to deliver total design gpm.

1. Measure total water flow.
   a. Position valves for full flow through coils.
   b. Measure flow by main flow meter, if installed.
   c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

2. Measure pump TDH as follows:
   a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
   b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
   c. Convert pressure to head and correct for differences in gage heights.
   d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
   e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.


B. Adjust flow-measuring devices installed in mains and branches to design water flows.

1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

C. Adjust flow-measuring devices installed at terminals for each space to design water flows.

1. Measure flow at terminals.
2. Adjust each terminal to design flow.
3. Re-measure each terminal after it is adjusted.
4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
5. Perform temperature tests after flows have been balanced.

D. For systems with pressure-independent valves at terminals:
   1. Measure differential pressure and verify that it is within manufacturer's specified range.
   2. Perform temperature tests after flows have been verified.

E. For systems without pressure-independent valves or flow-measuring devices at terminals:
   1. Measure and balance coils by either coil pressure drop or temperature method.
   2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

F. Verify final system conditions as follows:
   1. Re-measure and confirm that total water flow is within design.
   2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
   3. Mark final settings.

G. Verify that memory stops have been set.

3.12 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.

B. Adjust the variable-flow hydronic system as follows:
   1. Verify that the differential-pressure sensor is located as indicated.
   2. Determine whether there is diversity in the system.

C. For systems with no diversity:
   1. Adjust pumps to deliver total design gpm.
      a. Measure total water flow.
         1) Position valves for full flow through coils.
         2) Measure flow by main flow meter, if installed.
         3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
      b. Measure pump TDH as follows:
         1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
3) Convert pressure to head and correct for differences in gage heights.
4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.


2. Adjust flow-measuring devices installed in mains and branches to design water flows.
   a. Measure flow in main and branch pipes.
   b. Adjust main and branch balance valves for design flow.
   c. Re-measure each main and branch after all have been adjusted.

3. Adjust flow-measuring devices installed at terminals for each space to design water flows.
   a. Measure flow at terminals.
   b. Adjust each terminal to design flow.
   c. Re-measure each terminal after it is adjusted.
   d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
   e. Perform temperature tests after flows have been balanced.

4. For systems with pressure-independent valves at terminals:
   a. Measure differential pressure and verify that it is within manufacturer's specified range.
   b. Perform temperature tests after flows have been verified.

5. For systems without pressure-independent valves or flow-measuring devices at terminals:
   a. Measure and balance coils by either coil pressure drop or temperature method.
   b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

6. Prior to verifying final system conditions, determine the system differential-pressure set point.
7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
8. Mark final settings and verify that all memory stops have been set.
9. Verify final system conditions as follows:
   a. Re-measure and confirm that total water flow is within design.
b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
c. Mark final settings.

10. Verify that memory stops have been set.

D. For systems with diversity:

1. Determine diversity factor.
2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
3. Adjust pumps to deliver total design gpm.
   a. Measure total water flow.
      1) Position valves for full flow through coils.
      2) Measure flow by main flow meter, if installed.
      3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
   b. Measure pump TDH as follows:
      1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
      2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
      3) Convert pressure to head and correct for differences in gage heights.
      4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
      5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

4. Adjust flow-measuring devices installed in mains and branches to design water flows.
   a. Measure flow in main and branch pipes.
   b. Adjust main and branch balance valves for design flow.
   c. Re-measure each main and branch after all have been adjusted.

5. Adjust flow-measuring devices installed at terminals for each space to design water flows.
   a. Measure flow at terminals.
   b. Adjust each terminal to design flow.
   c. Re-measure each terminal after it is adjusted.
   d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
   e. Perform temperature tests after flows have been balanced.
6. For systems with pressure-independent valves at terminals:
   a. Measure differential pressure, and verify that it is within manufacturer's specified range.
   b. Perform temperature tests after flows have been verified.

7. For systems without pressure-independent valves or flow-measuring devices at terminals:
   a. Measure and balance coils by either coil pressure drop or temperature method.
   b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.

9. Prior to verifying final system conditions, determine system differential-pressure set point.

10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.

11. Mark final settings and verify that memory stops have been set.

12. Verify final system conditions as follows:
   a. Re-measure and confirm that total water flow is within design.
   b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
   c. Mark final settings.

13. Verify that memory stops have been set.

3.13 TOLERANCES
A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 5 percent.
   2. Air Outlets and Inlets: Plus or minus 5 percent.
   3. Heating-Water Flow Rate: Plus or minus 5 percent.
   4. Cooling-Water Flow Rate: Plus or minus 5 percent.

3.14 REPORTING
A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.15 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
   a. Indicated versus final performance.
   b. Notable characteristics of systems.
   c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:
   a. Settings for outdoor-, return-, and exhaust-air dampers.
   b. Conditions of filters.
   c. Cooling coil, wet- and dry-bulb conditions.
d. Face and bypass damper settings at coils.
e. Fan drive settings including settings and percentage of maximum pitch diameter.
f. Inlet vane settings for variable-air-volume systems.
g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Pipe and valve sizes and locations.
4. Terminal units.
5. Balancing stations.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:
   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Unit arrangement and class.
   g. Discharge arrangement.
   h. Sheave make, size in inches, and bore.
   i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
   j. Number, make, and size of belts.
   k. Number, type, and size of filters.

2. Motor Data:
   a. Motor make, and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):
   a. Total air flow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Filter static-pressure differential in inches wg.
   f. Preheat-coil static-pressure differential in inches wg.
   g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:
   a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch
f. Make and model number.
g. Face area in sq. ft.
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):
   a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psi.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:
   a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:
   a. Motor make, and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
   g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Suction static pressure in inches wg.

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:
   a. System and air-handling-unit number.
   b. Location and zone.
   c. Traverse air temperature in deg F.
   d. Duct static pressure in inches wg.
   e. Duct size in inches
   f. Duct area in sq. ft.
   g. Indicated air flow rate in cfm.
   h. Indicated velocity in fpm.
   i. Actual air flow rate in cfm.
   j. Actual average velocity in fpm.
   k. Barometric pressure in psig.

I. Air-Terminal-Device Reports:

1. Unit Data:
   a. System and air-handling unit identification.
   b. Location and zone.
   c. Apparatus used for test.
   d. Area served.
   e. Make.
   f. Number from system diagram.
   g. Type and model number.
   h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):
   a. Air flow rate in cfm.
   b. Air velocity in fpm.
   c. Preliminary air flow rate as needed in cfm.
   d. Preliminary velocity as needed in fpm.
   e. Final air flow rate in cfm.
   f. Final velocity in fpm.
   g. Space temperature in deg F.

J. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
   1. Unit Data:
      a. System and air-handling-unit identification.
      b. Location and zone.
      c. Room or riser served.
      d. Coil make and size.
      e. Flowmeter type.
   2. Test Data (Indicated and Actual Values):
      a. Air flow rate in cfm.
      b. Entering-air temperature in deg F.
      c. Leaving-air temperature in deg F.

K. Instrument Calibration Reports:
   1. Report Data:
      a. Instrument type and make.
      b. Serial number.
      c. Application.
      d. Dates of use.
      e. Dates of calibration.

3.16 INSPECTIONS

A. Initial Inspection:
   1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
   2. Check the following for each system:
      a. Measure airflow of at least 10 percent of air outlets.
      b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:
1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Commissioning Authority.
3. Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.17 ADDITIONAL TESTS
A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593
1.
SECTION 230719
HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section includes insulating the following HVAC piping systems:
      1. Condensate drain piping, indoors and outdoors.
      2. Heating hot-water piping, indoors.
      3. Refrigerant suction and hot-gas piping, indoors and outdoors.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
   B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
      1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
      2. Detail attachment and covering of heat tracing inside insulation.
      3. Detail insulation application at pipe expansion joints for each type of insulation.
      4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
      5. Detail removable insulation at piping specialties.
      6. Detail application of field-applied jackets.
      7. Detail application at linkages of control devices.
   C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.
      1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.

1.4 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For qualified Installer.
B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.
PART 2 - PRODUCTS

2.1 INSULATION MATERIALS


B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
   1. **Products**: Subject to compliance with requirements, *provide one of the following*:
      a. Aeroflex USA, Inc.; Aerocel.
      b. Armacell LLC; AP Armaflex.
      c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   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. CertainTeed Corp.; SoftTouch Duct Wrap.
      b. Johns Manville; Microlite.
      c. Knauf Insulation; Friendly Feel Duct Wrap.
      d. Manson Insulation Inc.; Alley Wrap.
      e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber, Preformed Pipe Insulation:
   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. Fibrex Insulations Inc.; Coreplus 1200.
      b. Johns Manville; Micro-Lok.
      c. Knauf Insulation; 1000-Degree Pipe Insulation.
      d. Manson Insulation Inc.; Alley-K.
2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Aeroflex USA, Inc.; Aeroseal.
   b. Armacell LLC; Armaflex 520 Adhesive.
   d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   b. - Marathon Industries; 225.
   d. Mon-Eco Industries, Inc.; 22-25.
   e. Or approved equal.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. **Products**: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
   b. Marathon Industries; 570.
   d. Or approved equal.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. **Products**: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   c. **Vimasco Corporation**; 713 and 714.
   d. Or approved equal.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.

2.5 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
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. **Johns Manville:** Zeston.
   b. **P.I.C. Plastics, Inc.**; FG Series.
   c. **Proto Corporation:** LoSmoke.
   d. **Speedline Corporation:** SmokeSafe.
   e. Or approved equal.

2. Adhesive: As recommended by jacket material manufacturer.

3. Color: **White**.

4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. **Self-Adhesive Outdoor Jacket:** 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.

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. **Polyguard Products, Inc.**; Alumaguard 60.
   b. Or approved equal.

2.6 **SECUREMENTS**

A. **Bands:**

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. **ITW Insulation Systems:** Gerrard Strapping and Seals.
   b. **RPR Products, Inc.**; Insul-Mate Strapping, Seals, and Springs.
   c. Or approved equal.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, **Type 304; 1/2 inch** wide with **wing seal**.

3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, **3/4 inch** wide with **wing seal**.


B. **Staples:** Outward-clinching insulation staples, nominal **3/4-inch**-wide, stainless steel or Monel.

C. **Wire:** **0.080-inch nickel-copper alloy** or **0.062-inch soft-annealed, galvanized steel**.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.
F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   a. For below-ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
   1. Install pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
   4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install mitered sections of pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed valve covers manufactured of same material as pipe insulation when available.
   2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Install insulation to flanges as specified for flange insulation application.
   4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
   3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

C. Where PVDC jackets are indicated, install as follows:
   1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
   2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
   3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
   4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
   5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.9 FINISHES
   A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
   B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
   C. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL
   A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
   B. Perform tests and inspections.
   C. Tests and Inspections:
      1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one locations of straight pipe, one locations of threaded fittings, one locations of welded fittings, one locations of threaded strainers, one locations
of welded strainers, one locations of threaded valves, and one locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Flexible Elastomeric: 3/4 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F and Below:

1. NPS 12 and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.

C. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick or as per manufacturer’s recommendation whichever is thicker.

D. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick or as per manufacturer’s recommendation whichever is thicker.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 2 inches thick or as per manufacturer’s recommendation, whichever is thicker.
B. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be the following:

   a. Flexible Elastomeric: 2 inches thick or as per manufacturer’s recommendation, whichever is thicker.

3.14 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:

   1. PVC: 30 mils thick.

END OF SECTION 230719
SECTION 232113

HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
   1. Condensate-drain piping.
   2. Safety-valve-inlet and -outlet piping.

1.3 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
   1. Condensate-Drain Piping: 80 Psig at 150 deg F.
   2. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following:
   1. Pressure-seal fittings.
   2. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
   3. Hydronic specialties.

B. Shop Drawings: Detail, at 1/4 scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding certificates.

C. Field quality-control test reports.
D. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
   2.

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping." for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

B. DWV Copper Tubing: ASTM B 306, Type DWV.
2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.


C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.

D. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

E. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
   2. End Connections: Butt welding.
   3. Facings: Raised face.

F. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.
2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      c. Wilkins; a Zurn company.
      d. Approved Equal.
   2. Description:
      b. Pressure Rating: 125 psig minimum at 180 deg F.
      c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
   1. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      c. Wilkins; a Zurn company.
      d. Approved Equal.
   2. Description:
      b. Factory-fabricated, bolted, companion-flange assembly.
      c. Pressure Rating: 125 psig minimum at 180 deg F.
      d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
   1. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. Central Plastics Company.
      d. Pipeline Seal and Insulator, Inc.
      e. Approved Equal.
   2. Description:
      a. Nonconducting materials for field assembly of companion flanges.
      b. Pressure Rating: 150 psig.
      c. Gasket: Neoprene or phenolic.
      d. Bolt Sleeves: Phenolic or polyethylene.
      e. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:
   1. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Grinnell Mechanical Products.
      b. Matco-Norca, Inc.
      c. Victaulic Company.
2. Approved Equal.

2. Description:
   a. Standard: IAPMO PS 66
   b. Electroplated steel nipple, complying with ASTM F 1545.
   c. Pressure Rating: 300 psig at 225 deg F.
   d. End Connections: Male threaded or grooved.
   e. Lining: Inert and noncorrosive, propylene.

2.5 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 230523 "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified below:
   1. Control Valves
      a. Ball Valves, 1/2 through 2 in.:
         1) Ball Valves shall have forged brass bodies.
         2) Valves shall have available either Chrome Plated Brass Balls or 300 Series Stainless Steel Balls in all sizes.
         3) Valves shall have available either Nickel Plated Brass Stems or 300 Series Stainless Steel Stems with a blow-out proof stem design in all sizes.
         4) Valves shall have Graphite reinforced Polytetrafluoroethylene (PTFE) seats with Ethylene Propylene Diene Monomer (EPDM) O-ring backing.
         5) Stem seals shall be double EPDM O-rings.
         6) Flow Characterization Disk shall be manufactured from Amodel AS-1145HS Polyphthalamide Resin and rated for 50 psid maximum differential pressure and shall be inserted against the casting of the valve.
         7) All ball valves with internal pipe thread end connections shall be rated to 580 psi maximum static pressure at 203°F (95°C) fluid temperature.
         8) All ball valves with sweat end connections or press end connection shall be rated to 300 psig maximum static pressure at 203°F (95°C) fluid temperature.
         9) All valves shall be rated for service with hot water, chilled water and 50% glycol solutions.
        10) Ball Valves with stainless steel balls and stems shall be rated for use with 15 psig saturated steam.
        11) Flow Characteristics shall be equal percentage on the control port. Bypass port on three-way valves shall have linear flow characteristics.
        12) Valves shall have a maximum leakage specification of 0.01% of maximum flow for the control port, ANSI/FCI 70-2, Class 4 and 1% of maximum flow, bypass port.
        13) Valves shall be maintenance free
        14) Valves shall be provided with a 5 year warranty.
        15) Valves shall be rated for 200 psig closeoff pressure.
        16) Valve actuators shall be UL-recognized or CSA-certified.
        17) Valves shall be Johnson Controls VG1000 Series ball valves or approved equal.
   2. Temperature Sensors
      a. General Requirements:
         1) Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.
         2) The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.
3) The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:
   a) Heating hot water accuracy ± 0.5°F
   b) Room temperature accuracy ± 0.5°F
b. Room Temperature Sensors
1) Room sensors shall be constructed for either surface or wall box mounting.
2) Room sensors shall have the following options when specified:
   a) Setpoint warmer/cooler dial or reset slide switch providing a +3 degree (adjustable) range.
   b) Individual heating/cooling setpoint slide switches.
   c) A momentary override request push button for activation of after-hours operation.
   d) Analog thermometer.
c. Thermo wells
1) Thermowell manufacturer shall have models available in stainless steel, brass body, and copper bulb.
2) When thermo wells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and sensor.
3) Thermo wells shall be pressure rated and constructed in accordance with the system working pressure.
4) Thermo wells and sensors shall be mounted in a direct mount (no adapter) offering faster installation or 1/2” NPT saddle and allow easy access to the sensor for repair or replacement.
5) Thermo wells constructed of 316 stainless steel shall comply with Canadian Registration Number (CRN) pressure vessel rating.

3. Local Control Panels
a. All control panels shall be factory constructed, incorporating the BMS manufacturer’s standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch.
b. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.
c. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.
d. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
e. All wiring shall be neatly installed in plastic trays or tie-wrapped.
f. A 120 volt convenience outlet, fused on/off power switch, and required transformers shall be provided in each enclosure.

C. Bronze, Calibrated-Orifice, Balancing Valves:
1. Available Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Armstrong Pumps, Inc.
   b. Bell & Gossett Domestic Pump; a division of ITT Industries.
   c. Griswold Controls.
   d. Taco.
   e. Approved Equal.
2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
8. Handle Style: Lever, with memory stop to retain set position.
10. Maximum Operating Temperature: 250 deg F.

D. Bronze or Copper-Alloy, Combination Balancing & Shutoff Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. a. Armstrong Pumps, Inc.
   b. Nibco
   c. Tour & Andersson; available through Victaulic Company
   d. Approved Equal.
3. Body: Bronze or Ametal copper alloy, globe Y-pattern, multi-turn
4. Seat: PTFE or Ametal.
5. End Connections: Threaded or socket.
7. Handle Style: Digital handwheel, with concealed memory stop to retain set position.
8. CWP Rating: Minimum 300 psig (2065 kPa).
10. Coil Components: Install Series 78U union port fitting, Series 78Y strainer/ball valve or Series 78T union/ball valve combination, and two stainless steel flexible hoses to complete terminal hookup at coil outlet. Victaulic/Tour & Andersson Series 799 or Series 79V with ATC valve or approved equal.

E. Cast-Iron, Ductile-Iron or Steel, Combination Balancing & Shutoff Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. a. Armstrong Pumps, Inc.
   b. Nibco
   c. Tour & Andersson; available through Victaulic Company
   d. Approved Equal.
3. Body: Cast-iron, ductile-iron or steel body, globe Y-pattern multi-turn
5. Seat: PTFE or ductile iron.
6. End Connections: Flanged or grooved.
8. Handle Style: Digital handwheel, with concealed memory stop to retain set position.
9. CWP Rating: Minimum 250 (1720 kPa) for flanged or 350 psig (2400 kPa) for grooved.
10. Maximum Operating Temperature: 250 deg F (121 deg C). On grooved installations, the coupling gasket rating will dictate the rating.
11. Coil hook-up assemblies may be used to reduce installation time and space requirements. Victaulic/Tour & Andersson Supply side assembly 79C and return side assembly 79D or approved equal.

F. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
1. Available Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. **Armstrong Pumps, Inc.**
b. **Bell & Gossett Domestic Pump; a division of ITT Industries.**
c. **Griswold Controls.**
d. **Taco.**
e. Approved Equal.

2. **Body:** Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. **Ball:** Brass or stainless steel.
4. **Stem Seals:** EPDM O-rings.
5. **Disc:** Glass and carbon-filled PTFE.
6. **Seat:** PTFE.
7. **End Connections:** Flanged or grooved.
8. **Pressure Gage Connections:** Integral seals for portable differential pressure meter.
9. **Handle Style:** Lever, with memory stop to retain set position.
10. **CWP Rating:** Minimum 125 psig.
11. **Maximum Operating Temperature:** 250 deg F.

G. **Diaphragm-Operated Safety Valves:**
1. **Available Manufacturers:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. **Armstrong Pumps, Inc.**
   b. **Bell & Gossett Domestic Pump; a division of ITT Industries.**
   c. **Watts Regulator Co.; a division of Watts Water Technologies, Inc.**
   d. Approved Equal.
2. **Body:** Bronze or brass.
3. **Disc:** Glass and carbon-filled PTFE.
4. **Seat:** Brass.
5. **Stem Seals:** EPDM O-rings.
6. **Diaphragm:** EPT.
7. **Wetted, Internal Work Parts:** Brass and rubber.
8. **Inlet Strainer:** Removable without system shutdown.
9. **Valve Seat and Stem:** Noncorrosive.
10. **Valve Size, Capacity, and Operating Pressure:** Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

2.6 **AIR CONTROL DEVICES**

A. **Available Manufacturers:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

B. **Manual Air Vents:**
1. **Body:** Bronze.
2. **Internal Parts:** Nonferrous.
3. **Operator:** Screwdriver or thumbscrew.
4. **Inlet Connection:** NPS 1/2.
5. **Discharge Connection:** NPS 1/8.
6. **CWP Rating:** 150 psig.
7. **Maximum Operating Temperature:** 225 deg F.

C. **Automatic Air Vents:**
1. **Body:** Bronze or cast iron.
2. **Internal Parts:** Nonferrous.
2.7 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:
   1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
   2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
   3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.

B. Basket Strainers:
   1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
   2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
   3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.

C. Stainless-Steel Bellow, Flexible Connectors:
   2. End Connections: Threaded or flanged to match equipment connected.
   4. CWP Rating: 150 psig.
   5. Maximum Operating Temperature: 250 deg F.

D. Spherical, Rubber, Flexible Connectors:
   2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
   4. CWP Rating: 150 psig.
   5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Condensate-Drain Piping: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints.

B. Air-Vent Piping:
   1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
   2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
C. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.
B. Install throttling-duty valves at each branch connection to return main.
C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
D. Install check valves at each pump discharge and elsewhere as required to control flow direction.
E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
E. Install piping to permit valve servicing.
F. Install piping at indicated slopes.
G. Install piping free of sags and bends.
H. Install fittings for changes in direction and branch connections.
I. Install piping to allow application of insulation.
J. Select system components with pressure rating equal to or greater than system operating pressure.
K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

R. Identify piping as specified in ASME 13.1

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
   2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
   3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
   4. Spring hangers to support vertical runs.
   5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
   6. 

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
   2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
   3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.

D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

### 3.5 PIPE JOINT CONSTRUCTION

**A.** Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

**B.** Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

**C.** Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.


**E.** Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.


**G.** Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.6 HYDRONIC SPECIALTIES INSTALLATION

**A.** Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

**B.** Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.

### 3.7 TERMINAL EQUIPMENT CONNECTIONS

**A.** Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

**B.** Install control valves in accessible locations close to connected equipment.

**C.** Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

**D.** Install ports for pressure gages and thermometers at coil inlet and outlet connections.
3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:
   1. Leave joints, including welds, uninsulated and exposed for examination during test.
   2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure.
   If temporary restraints are impractical, isolate expansion joints from testing.
   3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
   4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable
      of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate
      equipment.
   5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect
      against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:
   1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing.
      Another liquid that is safe for workers and compatible with piping may be used.
   2. While filling system, use vents installed at high points of system to release air. Use drains
      installed at low points for complete draining of test liquid.
   3. Isolate expansion tanks and determine that hydronic system is full of water.
   4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's
      working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve,
      or other component in system under test. Verify that stress due to pressure at bottom of vertical
      runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in
      Appendix A in ASME B31.9, "Building Services Piping."
   5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and
      connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and
      repeat hydrostatic test until there are no leaks.
   6. Prepare written report of testing.

C. Perform the following before operating the system:
   1. Open manual valves fully.
   2. Inspect pumps for proper rotation.
   3. Set makeup pressure-reducing valves for required system pressure.
   4. Inspect air vents at high points of system and determine if all are installed and operating freely
      (automatic type), or bleed air completely (manual type).
   5. Set temperature controls so all coils are calling for full flow.
   6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling
      towers, to specified values.
   7. Verify lubrication of motors and bearings.

END OF SECTION 232113
SECTION 232300
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS
A. Line Test Pressure for Refrigerant R-410A:
   1. Suction Lines for Air-Conditioning Applications: 300 psig
   2. Suction Lines for Heat-Pump Applications: 535 psig
   3. Hot-Gas and Liquid Lines: 535 psig

1.4 SUBMITTALS
A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
   1. Thermostatic expansion valves.
   2. Solenoid valves.
   3. Hot-gas bypass valves.
   4. Filter dryers.
   5. Strainers.
   6. Pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
   1. Shop Drawing Scale: 1/4 inch equals 1 foot
   2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between
compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Welding certificates.
D. Field quality-control test reports.
E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or Type L Wrought-Copper Fittings: ASME B16.22.
C. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
D. Brazing Filler Metals: AWS A5.8.
E. Flexible Connectors:
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch long assembly.
4. Pressure Rating: Factory test at minimum 500 psig
5. Maximum Operating Temperature: 250 deg F

2.2 VALVES AND SPECIALTIES

A. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig

B. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 115-V ac coil.
6. Working Pressure Rating: 400 psig
7. Maximum Operating Temperature: 240 deg F

C. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig
6. Maximum Operating Temperature: 240 deg F

D. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
E. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
5. Seat: Polytetrafluoroethylene.
7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 208-V ac coil.
9. Throttling Range: Maximum 5 psig
10. Working Pressure Rating: 500 psig
11. Maximum Operating Temperature: 240 deg F

F. Straight-Type Strainers:

2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig
5. Maximum Operating Temperature: 275 deg F

G. Moisture/Liquid Indicators:

2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig
7. Maximum Operating Temperature: 240 deg F

H. Permanent Filter Dryers: Where applicable shall comply with ARI 730.

2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Maximum Pressure Loss: 2 psig
5. Rated Flow: tons
6. Working Pressure Rating: 500 psig
7. Maximum Operating Temperature: 240 deg F

I. Mufflers:

2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig
4. Maximum Operating Temperature: 275 deg F

J. Receivers: Comply with ARI 495.
1. Comply with UL 207; listed and labeled by an NRTL.
2. Body: Welded steel with corrosion-resistant coating.
3. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
4. End Connections: Socket or threaded.
5. Working Pressure Rating: 500 psig
6. Maximum Operating Temperature: 275 deg F

K. Liquid Accumulators: Comply with ARI 495.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig
4. Maximum Operating Temperature: 275 deg F

2.3 REFRIGERANTS

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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.
5. Approved Equal.

C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

2.4 REFRIGERANT INSULATION

A. Insulation shall be a flexible, closed-cell elastomeric pipe insulation: AP Armaflex, AC Accoflex. Adhesive shall be Armaflex 520, 520 Black or 520 BLV Adhesive. The insulation must conform to ASTM C534 Grade 1, Type I.

B. Insulation materials shall have a closed cell structure to prevent moisture from wicking which makes it an efficient insulation.

C. Insulation materials shall be manufactured without the use of CFC’s, HFC’s or HCFC’s. It is also formaldehyde free, low VOCs, fiber free, dust free and resists mold and mildew.

D. Insulation materials shall have a flame-spread index of less than 25 and a smoke-developed index of less than 50 as tested in accordance with ASTM E 84. In addition, the products, when tested, shall not melt or drip flaming particles, and the flame shall not be progressive.
E. Insulation materials shall have a maximum thermal conductivity of 0.27 Btu-in./h-ft °F at a 75°F mean temperature as tested in accordance with ASTM C 177 or ASTM C 518.

F. Insulation materials shall have a maximum water vapor transmission of 0.08 perm-inches when tested in accordance with ASTM E 96, Procedure A.

2.5 Insulation Application

A. Design Conditions of 91°F DB and 71°F WB.

B. All liquid and suction lines shall be insulated continuously from a point 6” inside the casing to the suction service valve at the compressor.

C. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inch thick.

D. All refrigerant copper lines must be free of extraneous chemicals such as corrosive cleaners or building materials’ dust prior to the installation of the insulation. The insulation must be clean and dry prior to installation.

E. Refrigerant pipe shall be sealed while slipping on insulation to prevent foreign matter from entering the tube.

F. Insulation is to be slid onto pipe; longitudinal slitting of the insulation is not allowed except on mitered sections. Insulation shall be pushed onto pipe, not pulled.

G. Insulation shall be mitered, preadhered and longitudinally slit inside throat to fit over all P-traps, tees and elbows or bends over 90°.

H. All butt joints and mitered seams shall be adhered with full coverage of adhesive on both surfaces. Insulation shall not be stretched when adhering.

I. At the beginning, at every 12 to 18 feet, and at the ends of piping runs, the insulation shall be adhered directly to the copper using a 2” strip of adhesive. Insulation should not be adhered to the pipe at the extreme low points in any piping run.

J. Saddles shall be installed under all insulated lines at unistrut clamps, hangers, or locations where insulation may be compressed.

K. Wood dowels or blocks, of a thickness equal to the insulation, can be inserted and must be completely sealed into the insulation at the saddle locations. All seams shall be sealed with high contact adhesive.

L. All insulation exposed to sunlight or installed outdoors shall be protected with two coats of weather resistant coating.
PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A/R-407C

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Suction Lines NPS 3-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Hot-Gas and Liquid Lines
   1. NPS 5/8 and Smaller: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
   2. NPS 3/4 to NPS 1: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or joints.

D. Safety-Relief-Valve Discharge Piping: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

E. All buried copper piping shall be Class J. Make all buried copper piping field wrapped per section 3.3.W. Extend wrapping 5 feet minimum in all directions from connection.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
   1. Install valve so diaphragm case is warmer than bulb.
   2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
   3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
   1. Solenoid valves.
   2. Thermostatic expansion valves.
   3. Hot-gas bypass valves.
   4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.
K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 8 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:
   1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
   2. Install horizontal suction lines with a uniform slope downward to compressor.
   3. Install traps and double risers to entrain oil in vertical runs.
   4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Division 7 Section "Through-Penetration Firestop Systems."

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Division 7 Section "Joint Sealants" for materials and methods.

V. Identify refrigerant piping and valves according to Division 15 Section "Mechanical Identification."

W. Below Grade Piping – Pre-Insulated
   1. Refrigerant lines must be installed below the frost line; location below the frost line depends on the amount of foot or vehicle traffic that may pass over the refrigerant line path.
   2. Do not create any traps in the line. If a run resembles a trap, a minimum length of 12 inches must be provided for the low end of the U shaped trap.
   3. Use 45° elbows underground to simplify covering refrigerant lines with casing.
4. Refrigerant piping should be pressure-tested before being insulated and covered with casing. Casing must be watertight as any presence of moisture may reduce performance and possibly cause premature equipment failure. Install a watertight enclosure where the piping enters and exits the ground.

5. Refrigerant lines must be insulated separately based on local code or a minimum of \( \frac{1}{2} \)” insulation, whichever is more stringent.

6. If more than one system is installed, use a separate housing for each set of piping.

7. See M8.00 for buried piping details.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

   1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
   2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

   1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.

I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 15 Section "Hangers and Supports."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4 Maximum span, 96 inches minimum rod size, 3/8 inch
5. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

D. Support multi floor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
   a. Fill system with nitrogen to the required test pressure.
   b. System shall maintain test pressure at the manifold gage throughout duration of test.
   c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
   d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
4. Check the type of refrigerant used in the system to be serviced.
   a. Refrigerant Type: Multi air conditioner for building application CITY MULTI R2 TJMU-A, YJMU-A series R410A.
5. Check the symptoms exhibited by the unit to be serviced.
   a. Refer to this service handbook for symptoms relating to the refrigerant cycle.
6. Thoroughly read the safety precautions at the beginning of this manual.
7. Verification of the connecting pipes: Verify the type of refrigerant used for the unit to be moved or replaced.
8. Keep the inner and outer surfaces of the pipes clean and free of such contaminants as sulfur, oxides, dust, dirt, shaving particles, oil, and water. These types of contaminants inside the refrigerant pipes may cause the refrigerant oil to deteriorate.
9. If there is a leak of gaseous refrigerant and the remaining refrigerant is exposed to an open flame, a poisonous gas hydrofluoric acid may form. Keep workplace well ventilated.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:
   1. Install core in filter dryers after leak test but before evacuation.
   2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
   3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
   4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
   1. Open shutoff valves in condenser water circuit.
   2. Verify that compressor oil level is correct.
   3. Open compressor suction and discharge valves.
   4. Open refrigerant valves except bypass valves that are used for other purposes.
   5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300
SECTION 238126
SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section Includes:
   1. Split-system air conditionings

1.3 SUMMARY
A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.5 INFORMATIONAL SUBMITTALS
A. Field quality-control reports.

B. Warranty: Sample of special warranty.
1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals. Provide startup/commissioning reports provided by manufacturer for VRF system. Information shall include evacuation/pressure test procedures/results, piping line lengths, unit addresses/model/serial numbers, voltage/amp readings, and indoor unit operating conditions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filters: **One** set(s) for each air-handling unit.

1.8 QUALITY ASSURANCE

A. 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.

B. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

C. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

D. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

E. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.

F. ASHRAE Compliance:
   1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

   2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."

G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
1.9 COORDINATION
A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.10 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
1. Warranty Period:
   a. For Compressor: Six year(s) from date of installation.
   b. For Parts: One year(s) from date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   2. Mitsubishi Electric & Electronics USA, Inc.
   3. SANYO North America Corporation;
   4. LG Electronics

2.2 INDOOR UNITS (4 TONS OR LESS)
A. Evaporator-Fan Components:
   1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
   2. Insulation: Faced, glass-fiber duct liner.
   4. Fan: Forward curved, double-width wheel; directly connected to motor.
   5. Fan Motors:
      a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
      b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
      c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
   6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
   7. Filters: Permanent, cleanable.
   8. Condensate Drain Pans:
a. Fabricated with **one** percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
   1) Length: Extend drain pan downstream from leaving face **to comply with ASHRAE 62.1**.
   2) Depth: A minimum of 2 inches deep.

b. One piece composite drain pan. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on **one end** of pan.
   1) Minimum Connection Size: 1-1/4”

9. Control: The units shall have controls factory mounted and wired by the same manufacturer of the outdoor unit. The control of the unit will be accomplished by a combination of communication bus between the indoor unit controller, outdoor unit controller and remote controller.

B. Wall-Mounted, Evaporator-Fan Components:
1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:
   a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
   c. Enclosure Type: Totally enclosed, fan cooled.
   d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
   e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
   f. Mount unit-mounted disconnect switches on **exterior** of unit.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:
   a. Fabricated with **two** percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
   1) Length: Extend drain pan downstream from leaving face **[to comply with ASHRAE 62.1]**
   2) Depth: A minimum of [1 inch (25 mm)] deep.
   b. Double-wall, [galvanized] steel sheet with space between walls filled with foam insulation and moisture-tight seal.
   c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on [one end] [both ends] of pan.
   1) Minimum Connection Size: [NPS 1 (DN 25)].
   d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
7. Air Filtration Section:
   a. General Requirements for Air Filtration Section:
   1) Comply with NFPA 90A.
2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.

3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

2.3 OUTDOOR UNIT (4 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:
1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
   a. Compressor Type: Scroll.
   b. The compressor shall be a DC rotary compressor with Variable Compressor Speed Inverter Technology. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which results in vast energy savings. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be intermittently applied to the compressor motor to maintain enough heat. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.
   c. Refrigerant Charge: R-410A.
   d. Refrigerant Coil:
      1) The outdoor coil shall be of nonferrous construction with lanced or corrugated fins on copper tubing.
      2) The coil fins will have a factory applied corrosion resistant blue-fin finish.
      3) The coil shall be protected with an integral metal guard.
      4) Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
      5) Comply with ARI 210/240.

3. Fan:
   a. The fan shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The fan shall be variable speed.

4. Low Ambient Wind Baffle: Permits 100% Cooling capacity down to 0 deg F

5. Control: The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.
2.4 ACCESSORIES

A. CONTROLS
1. General: The Controls Network (CN) shall be capable of supporting remote controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet®.

2. BACnet® Interface: BAC-HD150 or equivalent
   a. The BACnet® interface shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address.

3. Electrical Characteristics:
   a. General: The CN shall operate at 24VDC. Controller power and communications shall be via a common non-polar communications bus.

4. Wiring:
   a. Control wiring shall be installed in a daisy chain configuration from indoor unit to remote controller to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.
   b. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.
   c. Control wiring for the remote controllers shall be from the remote controller to the first associated indoor unit, then to the remaining associated indoor units in a daisy chain configuration.

5. Wiring type:
   a. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.
   b. Network wiring shall be CAT-5e with RJ-45 connection.

6. Remote Controllers: Backlit Simple MA Remote Controller or equivalent
   a. The Remote Controller shall be compact in size, approximately 3” x 5”.
   b. The Remote Controller shall supports temperature display selection of Fahrenheit or Celsius.
   c. The Remote Controller shall allow the user to change on/off, mode (cool, heat, auto (for VRF systems only), dry, and fan), temperature setting, and fan speed setting and airflow direction.
   d. The Remote Controller shall be able to limit the set temperature range.
   e. The Remote controller shall be capable of night setback control with upper and lower set temperature settings. The room temperature shall be sensed at either the Backlit Simple MA Remote Controller or the Indoor Unit dependent on the indoor unit dipswitch setting. The Backlit Simple MA Remote Controller shall display a four-digit error code in the event of system abnormality/error.
   f. The Remote Controller shall require no addressing. The Remote Controller shall connect using two-wire, stranded, non-polar control wire to connection terminal on the indoor unit.
B. Thermostat: Low voltage with sub base to control compressor speed, LEV position, and evaporator fan.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

E. Drain Hose: For condensate.

2.5 CAPACITIES AND CHARACTERISTICS

A. Refer to the schedules included on the drawings.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the manufacturer’s recommendation.

3.2 INSTALLATION

A. Install units level and plumb and according to manufacturer’s installation instructions.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports.

D. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. See Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Provide startup/commissioning reports provided by manufacturer for VRF system (greater than 5 tons). Information shall include evacuation/pressure test procedures/results, piping line lengths, unit addresses/model/serial numbers, voltage/amp readings, and indoor unit operating conditions.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126
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 University of Massachusetts 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 legal name of sub-bidder)

U.M.A. PROJECT NUMBER: Project #1008489/ UMA17-06

U.M.A. PROJECT NAME: UMass Mullins Center and Garber Field Video Boards

SUB-BID FOR SECTION: 260001 - Electrical 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 Commonwealth of Massachusetts General Laws, as amended. Sub-bid forms may be obtained at the Procurement website: http://www.umass.edu/procurement/constructionprojects.htm.

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 University of Massachusetts 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: Not Applicable.

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings: All Drawings listed in the Index of Drawings on the Drawings.
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, all work in the following Sections:

1. Section 260519 - Low-Voltage Electrical Power Conductors and Cables
2. Section 260526 - Grounding and Bonding for Electrical Systems
3. Section 260529 - Hangers and Supports for Electrical Systems
4. Section 260533 - Raceways and Boxes for Electrical Systems
5. Section 260553 - Identification for Electrical Systems
6. Section 262200 - Low-Voltage Transformers
7. Section 262416 - Panelboards
8. Section 262726 - Wiring Devices
9. Section 262813 - Fuses
10. Section 262816 - Enclosed Switches and Circuit Breakers
11. 

B. Alternates: Refer to Section 012300 - Alternates for alternates which affect the Work of this Section.

END OF SECTION
SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS
A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS
A. Qualification Data: For testing agency.
   B. Field quality-control reports.

1.6 QUALITY ASSURANCE
A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   2. Belden Inc.
   4. General Cable Technologies Corporation.
   5. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2, Type XHHW-2.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   3. Ideal Industries, Inc.
   4. O-Z/Gedney; a brand of the EGS Electrical Group.
   5. 3M; Electrical Markets Division.
   6. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. 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.

B. Comply with NFPA 70.
PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

D. Feeders in Cable Tray: Type THHN/THWN-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

H. Branch Circuits in Cable Tray: Type THHN/THWN-2, single conductors in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh and strain relief device at terminations to suit application.

J. VFC Output Circuits: Type TC-ER cable with dual tape shield.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
   1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
   1. After installing conductors and cables and before electrical circuitry has been energized, test conductors feeding the following critical equipment and services for compliance with requirements.
      a. Scoreboard
      b. Endzone Scoreboards
c. Garber field Scoreboard – Add Alternate #3


3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
   a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
   b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

B. Test and Inspection Reports: Prepare a written report to record the following:
   1. Procedures used.
   2. Results that comply with requirements.
   3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519
SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency and testing agency's field supervisor.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member Company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

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 UL 467 for grounding and bonding materials and equipment.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Approved equal.

2.2 SYSTEM DESCRIPTION

A. 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.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
   5. Three-phase motor and appliance branch circuits.
   6. Flexible raceway runs.
   7. Armored and metal-clad cable runs.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

   a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

   b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

   1. Power and Lighting Equipment or System with Capacity of 500 kVA and less: 10 ohms.

   2. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526
SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.
1.5 QUALITY ASSURANCE
   A. Comply with NFPA 70.

1.6 COORDINATION
   A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS
   A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
      1. Manufacturers:
         a. Allied Tube & Conduit.
         b. Cooper B-Line, Inc.
         c. ERICO International Corporation.
         d. Thomas & Betts Corporation.
         e. Unistrut; Atkore International. [http://www.specagent.com/LookUp/?ulid=1736&mf=04&src=wd]
      2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
      3. Channel Dimensions: Selected for applicable load criteria.
   B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
   C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
   D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
   E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
   F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Hilti, Inc.
      2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Cooper B-Line, Inc.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti, Inc.
      4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.


2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 051200 "Structural Steel Framing" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, Raceways may not be supported by openings through structure members.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 051200 "Structural Steel Framing" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Section 099000 "Painting and Coating" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529
SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
7. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.
B. GRC: Galvanized rigid steel conduit.
C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

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1. Structural members in paths of conduit groups with common supports.  
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.  
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.  
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.  
   4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.  
   3. Electri-Flex Company.  
   5. Republic Conduit.  
   7. Thomas & Betts Corporation.  
   8. Western Tube and Conduit Corporation.  

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.  
D. ARC: Comply with ANSI C80.5 and UL 6A.  
E. IMC: Comply with ANSI C80.6 and UL 1242.  
F. EMT: Comply with ANSI C80.3 and UL 797.
G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT:
      a. Material: Steel
      b. Type: compression.
   3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions were installed, and including flexible external bonding jumper.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. CANTEX Inc.
   3. Electri-Flex Company.
   4. Lamson & Sessions; Carlon Electrical Products.
   5. RACO; Hubbell.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. LFNC: Comply with UL 1660.

D. Rigid HDPE: Comply with UL 651A.

E. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
2. Hoffman.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. NEMA 4R.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type for indoor locations, flanged-and-gasketed type for outdoor locations unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
   1. Manufacturers: Subject to compliance with requirements, provide the following:
      a. Wiremold / Legrand. G3000, G4000, or G6000 series only.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Technologies Company; Cooper Crouse-Hinds.
   2. EGS/Appleton Electric.
   4. FSR Inc.
   5. Hoffman.
   7. Mono-Systems, Inc.
   9. RACO; Hubbell.
   10. Thomas & Betts Corporation.
11. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

J. Gangable boxes are allowed.

K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Armorcast
   b. NewBasis
PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC
3. Underground Conduit: RNC, Type EPC-40-PVC.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
   d. Gymnasiums.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
F. Install surface raceways only where indicated on Drawings.
G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION
A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
C. Complete raceway installation before starting conductor installation.
D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
H. Support conduit within 12 inches (300 mm) of enclosures to which attached.
I. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
   4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
J. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Q. Surface Raceways:
   1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
   2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service raceway enters a building or structure.
   3. Where otherwise required by NFPA 70.
T. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
   c. Attics: 135 deg F (75 deg C) temperature change.

U. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

W. Locate boxes so that cover or plate will not span different building finishes.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.

2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength.

3. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

   a. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

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3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes with bottom below frost line, 36” below grade.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533
SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Identification for raceways.
   2. Identification of power and control cables.
   3. Identification for conductors.
   4. Warning labels and signs.
   5. Instruction signs.
   7. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE


B. Comply with NFPA 70.


D. Comply with ANSI Z535.4 for safety signs and labels.
E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage and system or service type.

C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers diagonally over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stop stripes at legends.

F. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Colors for Cables Carrying Circuits at 600 V and Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage and system or service type.

C. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

C. Self-Adhesive, Self-Laminating Polyester Labels: Write-on, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

D. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:
1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.6 WARNING LABELS AND SIGNS


B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:
1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Warning label and sign shall include, but are not limited to, the following legends:
1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

2.9 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.

J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.

K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends.

B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot (3-mm) maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot (3-mm) maximum intervals.

D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

   2. Power.
E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
   
a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
   
b. Colors for 208/120-V Circuits:
      
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.

   d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

F. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

I. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive, self-laminating polyester labels with the conductor designation.


   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   
K. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

L. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

M. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.

N. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
   a. Indoor Equipment: Adhesive film label with clear protective overlay. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.

2. Equipment to Be Labeled:
   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   e. Enclosed switches.
   f. Enclosed circuit breakers.
   g. Enclosed controllers.
SECTION 262200
LOW-VOLTAGE TRANSFORMERS

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section Includes: Distribution, dry-type transformers rated 600 V and less, with capacities up to 1500 kVA.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
   2. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.
B. Shop Drawings:
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
   3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS
A. Seismic Qualification Certificates: For transformers, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For testing agency.
C. Source quality-control reports.
D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE
A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Sector; Eaton Corporation; Cutler-Hammer Products.
   2. General Electric Company.
   3. Square D Co./Group Schneider NA; Schneider Electric.
B. Source Limitations: Obtain each transformer type from single source from single manufacturer.
2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

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. Transformers Rated 15 kVA and Larger: Comply with NEMA TP 1 energy-efficiency levels as verified by testing according to NEMA TP 2.

D. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

E. Coils: Continuous windings without splices except for taps.
   1. Internal Coil Connections: Brazed or pressure type.
   2. Coil Material: Copper.

F. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

G. Shipping Restraints: Paint or otherwise color code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated.
   1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
   2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.

D. Transformer Enclosure Finish: Comply with NEMA 250.
   1. Finish Color: NSF/ANSI 61 gray.

E. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

F. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 80-deg C rise above 40-deg C ambient temperature.
2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.
   1. Resistance measurements of all windings at the rated voltage connections and at all tap connections.
   2. Ratio tests at the rated voltage connections and at all tap connections.
   3. Phase relation and polarity tests at the rated voltage connections.
   4. No load losses, and excitation current and rated voltage at the rated voltage connections.
   5. Impedance and load losses at rated current and rated frequency at the rated voltage connections.
   6. Applied and induced tensile tests.
   7. Regulation and efficiency at rated load and voltage.
   8. Insulation Resistance Tests:
      a. High-voltage to ground.
      b. Low-voltage to ground.
      c. High-voltage to low-voltage.
   9. Temperature tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.
F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

B. Anchor floor-mounted transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

   1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Secure transformer to concrete base according to manufacturer's written instructions.

D. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

E. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

   1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.
C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
   1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
   2. Perform two follow-up infrared scans of transformers, one at four months and the other at 11 months after Substantial Completion.
   3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.


3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200
SECTION 262416

PANELBOARDS

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. MCCB: Molded-case circuit breaker.

C. SPD: Surge protective device.

D. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.

2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.

2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.

4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Key interlock scheme drawing and sequence of operations.

1.5 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Contract Closeout," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 FIELD CONDITIONS

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Owner's written permission.
3. Comply with NFPA 70E.
1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. 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.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.
   a. Indoor Dry and Clean Locations: NEMA 250, Type 1

2. Height: 84 inches (2.13 m) maximum.

3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.

6. Finishes:
   a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

G. Phase, Neutral, and Ground Buses:

   a. Plating shall run entire length of bus.
   b. Bus shall be fully rated the entire length.
2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.

3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.


H. Conductor Connectors: Suitable for use with conductor material and sizes.
   2. Terminations shall allow use of 75 deg C rated conductors without derating.
   3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
   4. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
   5. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
   1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.

J. Existing Panelboard and Switchboard: For all panelboards, switchboards and electrical distribution equipment that are modified or new circuits and feeders are provided, the contractor shall provide an arc flash study and label the electrical equipment accordingly.

2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers:
   1. Square D
   2. Siemens
   3. GE
   4. Eaton

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
   1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."
   2. Fused Switch Features and Accessories:
      a. Standard ampere ratings and number of poles.
      b. Mechanical cover interlock with a manual interlock override, to prevent the opening of the cover when the switch is in the on position. The interlock shall prevent the switch from being turned on with the cover open. The operating handle shall have lock-off means with provisions for three padlocks.
2.3 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.
   1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
   1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.4 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment,
raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NEMA PB 1.

D. Equipment Mounting:
   1. Attach panelboard to the vertical finished or structural surface behind the panelboard.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

G. Mount panelboard cabinet plumb and rigid without distortion of box.

H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

I. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.

J. Install overcurrent protective devices and controllers not already factory installed.
   1. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

K. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

L. Install filler plates in unused spaces.

M. Stub four 1-inch (27-EMT) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-EMT) empty conduits into raised floor space or below slab not on grade.

N. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

O. Mount spare fuse cabinet in accessible location.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers Perform optional tests. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

   1. Measure loads during period of normal facility operations.
   2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
   4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.
3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416
SECTION 262726

WIRING DEVICES

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Weather-resistant receptacles.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.
B. GFCI: Ground-fault circuit interrupter.
C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ADMINISTRATIVE REQUIREMENTS

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.
1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper; 5351 (single), CR5362 (duplex).
   b. Hubbell; HBL5351 (single), HBL5352 (duplex).
   c. Leviton; 5891 (single), 5352 (duplex).
   d. Pass & Seymour; 5361 (single), 5362 (duplex).
2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; VGF20.
   b. Hubbell; GFR5352L.
   c. Pass & Seymour; 2095.
   d. Leviton; 7590.

2.5 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; CWL520R.
   b. Hubbell; HBL2310.
   c. Leviton; 2310.
   d. Pass & Seymour; L520-R.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.7 FINISHES

A. Device Color:
1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

G. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GF CI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

B. Wiring device will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.
END OF SECTION 262726
SECTION 262813

FUSES

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in control circuits and enclosed switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
   a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
   b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.


4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.

5. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Contract Closeout," include the following:

FUSES

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Construction Documents
1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Comply with NEMA FU 1 for cartridge fuses.
D. Comply with NFPA 70.
E. Comply with UL 248-11 for plug fuses.

1.7 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:
   1. Other Branch Circuits: Class RK1, time delay.
   2. Control Circuits: Class CC, time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.

C. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813
SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

(Part of Work of Section 260001 – ELECTRICAL WORK, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary
   Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Molded-case circuit breakers (MCCBs).
   4. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.
B. NO: Normally open.
C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects
   of earthquake motions determined according to ASCE/SEI 7.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component
   indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data
   on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified testing agency.
B. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
C. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Contract Closeout," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.8 QUALITY ASSURANCE
A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
D. 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.
E. Comply with NFPA 70.
1.9 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240 and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.
B. Type HD, Heavy Duty, Single Throw, 240 and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.


D. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

E. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
   A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
   B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
   C. Install fuses in fusible devices.
   D. Comply with NECA 1.

3.3 IDENTIFICATION
   A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
      1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
      2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL
   A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
   B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
   C. Perform tests and inspections.
      1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
   D. Acceptance Testing Preparation:
1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Test and adjust controls, remote monitoring, and safety. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816