The Commonwealth of Massachusetts

University of Massachusetts

Amherst

Contract For

Southwest Tower Doors & Lowrise Lounges

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 1st, 2012)

The University of Massachusetts Amherst will be posting **all addenda** to the procurement website:

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

Effective July 1st 2012 the university will **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.
TABLE OF CONTENTS FOR
UNIVERSITY OF MASSACHUSETTS AMHERST
BID PACKAGE

PART I -- Instructions to Bidders

Attachment A: Minimum Wage Rates (page 23)

Attachment B: Forms Used During Bidding (page 24)

   Sample Certificate of Eligibility – Prime Bidder (page 25)
   Sample Certificate of Eligibility - Sub-bidder (page 26)
   Update Statement – Prime Bidder
   Update Statement - Sub-bidder

   Form for General Bid
   Form for Sub-Bid
PART II -- Owner - Contractor Agreement

Exhibit A: Additional Insurance Provisions, if any. (page 68)

Exhibit B: Forms Used During Contract Award and Execution: (page 69)

- 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 for Subcontract

PART III -- 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
Procedure for Payment to Contractors

Form ST-5C
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)
Daily Time and Material Report for Change Orders
Request and Agreement for a Change in the Plans,
Specifications and/or Contract (UMA 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

PART IV – Supplementary General Conditions and Specifications
BID PACKAGE

PART I

INSTRUCTIONS TO BIDDERS

Instructions to Bidders

Attachment A: Minimum Wage Rates

Attachment B: Forms Used During Bidding

Sample Certificate of Eligibility – Prime Bidder

Sample Sub-bidder Certificate of Eligibility

Update Statement – Prime Bidder

Sub-bidder Update Statement

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. UMA17-05
Project No. 15-1004683
Title: Southwest Tower Doors & Lowrise Lounges

Category of Work:
General

Project Description and Scope:
Glass & Glazing, Resilient Floors, Painting, HVAC & Electrical Work
Note: Completion date based upon executed contract date is: August 14, 2017

Pre-Bid Meeting Information (if any):
November 14, 2016 at 10:00 a.m. at Physical Plant, 3rd Floor, Conference Room A, 360 Campus Center Way, Amherst, MA 01003

Deadline for filing filed Sub-bids is 12:00 noon on November 23, 2016.
Deadline for filing General bids is 2:00 p.m. on December 1, 2016.

8
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 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.

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 $ 100, 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 5% of Bid Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>088001</td>
<td>Glass &amp; Glazing</td>
<td></td>
</tr>
<tr>
<td>096550</td>
<td>Resilient Floors</td>
<td></td>
</tr>
<tr>
<td>099001</td>
<td>Painting</td>
<td></td>
</tr>
<tr>
<td>230001</td>
<td>HVAC</td>
<td></td>
</tr>
<tr>
<td>260001</td>
<td>Electrical Work</td>
<td></td>
</tr>
</tbody>
</table>

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-Bider’s category of work. If the alternate is not identified in the Bid Documents as affecting the sub-Bider's category of work then the sub-Bider 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-contract work to a SOMWBA certified M/WBE, and the filed sub-Bidder wishes that sub-contract 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-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.49, §§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.49 §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.
ATTACHMENT A

PREVAILING WAGE SCHEDULE

The minimum wage rates provided in the following pages have been provided by the Division of Occupational Safety of the Massachusetts Department of Labor and Workforce Development. The Awarding Authority is not responsible for errors or omissions in such wage rates.

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 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: ORCZTOKC095666
CONTRACTOR ADDRESS
CONTRACTOR CITY MA 0000

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
Date

for David B. Perini, Commissioner

Official DCAM Amendments Date Authorization

Extension to:

Name:

SPL:

GBC SPL:

AWL:

Category:

Address:
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
(Edited by UMass Amherst 1/19/2011)

INSTRUCTIONS
• 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 projected listed in Parts 1 and 2 must be part of your review. Contact the project references.

• AWARDING AUTHORITIES ARE STRONGLY ENCOURAGED TO REVIEW THE LOW BIDDER’S ENTIRE CERTIFICATION FILE AT THE DIVISION OF CAPITAL ASSET MANAGEMENT. Telephone (617) 727-9320 for an appointment.

**Bidding Limits**

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

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

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

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

(i) If the project is to be completed in less than 12 months, the annual dollar value of the work is equal to the full amount of the bid.

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

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

**Correction of Errors and Omissions in Update Statements**

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

**Correction of Other Defects:** An awarding authority may, in its discretion, give a contractor notice of defects, other than mistakes or omissions of form, in the contractor’s Update Statement, and an opportunity to correct such defects, provided the correction of such defects is not prejudicial to fair competition. An awarding authority may reject a corrected Update Statement if it contains unfavorable information about the contractor that was omitted from the Update Statement filed with the contractor’s bid. [810 CMR 8.05(2)].
PART 1 - COMPLETED PROJECTS

LIST ALL PUBLIC AND PRIVATE BUILDING PROJECTS YOUR FIRM HAS COMPLETED SINCE THE DATE 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>
</tr>
</thead>
<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>
</tr>
<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>
</tr>
<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>
</tr>
<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>
</tr>
<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>
</tr>
<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>
</tr>
<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>
</tr>
</tbody>
</table>

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>
<th>GC:</th>
<th>DESIGNER</th>
<th>OWNER</th>
<th>GC:</th>
<th>DESIGNER</th>
<th>OWNER</th>
<th>GC:</th>
<th>DESIGNER</th>
<th>OWNER</th>
<th>GC:</th>
<th>DESIGNER</th>
<th>OWNER</th>
<th>GC:</th>
<th>DESIGNER</th>
</tr>
</thead>
</table>

Provide the following reference information for each completed project listed on the previous page.
<table>
<thead>
<tr>
<th>GC:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OWNER:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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: _____

---

Division of Capital Asset Management  
Prime/General Contractor Update Statement Effective March 30, 2010  
Page 5 of 12
**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>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT TITLE &amp; LOCATION</td>
<td>WORK CATEGORY</td>
<td>START AND END DATES (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>
<td></td>
</tr>
</tbody>
</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).
Provide the following reference information for each incomplete 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>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 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>
</tr>
</thead>
<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>
<td>☐</td>
<td>☐</td>
</tr>
<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>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Has your firm failed or refused to complete any punch list work under any contract?</td>
<td>☐</td>
<td>☐</td>
</tr>
<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>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Has your surety taken over or been asked to complete any of your work under any contract?</td>
<td>☐</td>
<td>☐</td>
</tr>
<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>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Has your surety made payment to a materials supplier or other party under your payment bond on any contract?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Has any subcontractor filed a demand for direct payment with an awarding authority for a public project on any of your contracts?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. Have any of your subcontractors or suppliers filed litigation to enforce a mechanic’s lien against property in connection with work performed or materials supplied under any of your contracts?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. Have there been any deaths of an employee or others occurring in connection with any of your projects?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11. Has any employee or other person suffered an injury in connection with any of your projects resulting in their inability to return to work for a period in excess of one year?</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
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.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have any civil, judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to the procurement or performance of any construction contract, including but not limited to actions to obtain payment brought by subcontractors, suppliers or others?</td>
<td>YES</td>
</tr>
<tr>
<td>2. Have any criminal proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to the procurement or performance of any construction contract including, but not limited to, any of the following offenses: fraud, graft, embezzlement, forgery, bribery, falsification or destruction of records, or receipt of stolen property?</td>
<td>YES</td>
</tr>
<tr>
<td>3. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state’s or federal procurement laws arising out of the submission of bids or proposals?</td>
<td>YES</td>
</tr>
<tr>
<td>4. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of M.G.L. Chapter 268A, the State Ethics Law?</td>
<td>YES</td>
</tr>
</tbody>
</table>
### PART 4 - Legal or Administrative Proceedings; Compliance with Laws (continued)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state or federal law regulating hours of labor, unemployment compensation, minimum wages, prevailing wages, overtime pay, equal pay, child labor or worker’s compensation?</td>
<td>YES</td>
</tr>
<tr>
<td>6.</td>
<td>Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state or federal law prohibiting discrimination in employment?</td>
<td>YES</td>
</tr>
<tr>
<td>7.</td>
<td>Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a claim of repeated or aggravated violation of any state or federal law regulating labor relations?</td>
<td>YES</td>
</tr>
<tr>
<td>8.</td>
<td>Have any proceedings by a municipal, state, or federal agency been brought, concluded, or settled relating to decertification, debarment, or suspension of your firm or any principal or officer or anyone with a financial interest in your firm from public contracting?</td>
<td>YES</td>
</tr>
<tr>
<td>9.</td>
<td>Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of state or federal law regulating the environment?</td>
<td>YES</td>
</tr>
<tr>
<td>10.</td>
<td>Has your firm been fined by OSHA or any other state or federal agency for violations of any laws or regulations related to occupational health or safety? Note: this information may be obtained from OSHA’s Web Site at <a href="http://www.osha.gov">www.osha.gov</a></td>
<td>YES</td>
</tr>
<tr>
<td>11.</td>
<td>Has your firm been sanctioned for failure to achieve DBE/MBE/WBE goals, workforce goals, or failure to file certified payrolls on any public projects?</td>
<td>YES</td>
</tr>
<tr>
<td>12.</td>
<td>Other than previously reported in the above paragraphs of this Section I, have any administrative proceedings or investigations involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled by any local, state or federal agency relating to the procurement or performance of any construction contract?</td>
<td>YES</td>
</tr>
<tr>
<td>13.</td>
<td>Are there any other issues that you are aware which may affect your firm’s responsibility and integrity as a building contractor?</td>
<td>YES</td>
</tr>
</tbody>
</table>
PART 5 - SUPERVISORY PERSONNEL

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

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE OR FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 Business Address
name if no number)

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

SIGNATURE⇒

Bidder’s Authorized Representative

Division of Capital Asset Management
(Edited 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.

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)].

Division of Capital Asset Management
Sub-bidder Update Statement Effective March 30, 2010
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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OWNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGNER:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<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>
</tbody>
</table>
Provide the following reference information for each incomplete 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></td>
<td>Owner:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Designer:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GC:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Owner:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Designer:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GC:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Owner:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Designer:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GC:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Owner:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Designer:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GC:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Owner:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Designer:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GC:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<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>
<td>☐</td>
<td>☐</td>
</tr>
<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>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Has your firm failed or refused to complete any punch list work under any contract?</td>
<td>☐</td>
<td>☐</td>
</tr>
<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>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Has your surety taken over or been asked to complete any of your work under any contract?</td>
<td>☐</td>
<td>☐</td>
</tr>
<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>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Has your surety made payment to a materials supplier or other party under your payment bond on any contract?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Has any subcontractor filed a demand for direct payment with an awarding authority for a public project on any of your contracts?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. Have any of your subcontractors or suppliers filed litigation to enforce a mechanic’s lien against property in connection with work performed or materials supplied under any of your contracts?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. Have there been any deaths of an employee or others occurring in connection with any of your projects?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11. Has any employee or other person suffered an injury in connection with any of your projects resulting in their inability to return to work for a period in excess of one year?</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
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 Sub-Bidder Certificate of Eligibility was issued (not extended) to the date of the bid.

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

The term “anyone with a financial interest in your firm” as used in this Section “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.

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have any civil, judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to the procurement or performance of any construction contract, including but not limited to actions to obtain payment brought by subcontractors, suppliers or others?</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2. Have any criminal proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to the procurement or performance of any construction contract including, but not limited to, any of the following offenses: fraud, graft, embezzlement, forgery, bribery, falsification or destruction of records, or receipt of stolen property?</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of any state’s or federal procurement laws arising out of the submission of bids or proposals?</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4. Have any judicial or administrative proceedings involving your firm or a principal or officer or anyone with a financial interest in your firm been brought, concluded, or settled relating to a violation of M.G.L. Chapter 268A, the State Ethics Law?</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
## PART 4 - Legal or Administrative Proceedings; Compliance with Laws (continued)

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

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE OR FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
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.
FORM FOR GENERAL BID

To the Awarding Authority:

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

UMA No. 17-05 Project No. 15-1004683

Project Name: Southwest Tower Doors & Lowrise Lounges

in __________________________, 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.

$_______________________________ dollars ($_______)

(total bid in words)

**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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</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.
The undersigned further certifies under the penalties of perjury that:

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

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

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

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

Date ______________________, 20__.

________________________________________
(Name of General Bidder)

By _________________________________
(Print Name/Title of Person Signing Bid)

________________________________________
(Signature)

________________________________________
(Business Address)

________________________________________
(City and State)

________________________________________
(Telephone Number)  (Facsimile Number)
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
UNIVERSITY OF MASSACHUSETTS AMHERST
FORM FOR SUB-BID

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

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

1. Current Sub-Bidder Certificate of Eligibility issued by the Division of Capital Asset Management and Maintenance showing the Sub-Bidder or Trade Contractor is certified in the category of work for which this Sub-Bid is submitted.

2. Completed Sub-Bidder Update Statement. NOTE: All information and the documents called for in the update statement must be supplied. All information provided must be complete and accurate. A defect or omission in the Update Statement may result in the rejection of the Bid. Part 5 MUST list the NAMES of all supervisory personnel for this project.

3. Bid deposit meeting the requirements of Section 5.13 and 5.14 of the Instructions to Bidders.
To all General Bidders except those excluded:

A. The undersigned proposes to furnish all labor and materials required for completing, in accordance with the hereinafter described Plans, Specifications and addenda, all the work specified in Section No. ________________ of the Specifications and in any Plans specified in such section, prepared by ____________________________ for

(name of architect or engineer)

________________________  __________________________
(project number)  (project name)

in _____________________________, Massachusetts, for the Contract sum of

(city/town)

_______________________________dollars

($__________________________).

For Alternate No. 1: Add $________________ Subtract $________________

For Alternate No. 2: Add $________________ Subtract $________________

For Alternate No. 3: Add $________________ Subtract $________________

For Alternate No. 4: Add $________________ Subtract $________________

For Alternate No. 5: Add $________________ Subtract $________________

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

Name of Sub-bidder __________________________
C. This sub-bid

☐ May be used by any general bidder except: ____________________________

☐ May only be used by the following general bidders: ____________________

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

D. The undersigned agrees that, if it is selected as a sub-bidder, it will, within five days, Saturdays, Sundays, and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such general bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and if requested so to do in the general bid by such general bidder, who shall pay the premiums therefore, or if prequalification is required pursuant to section 44D3/4, furnish a performance and payment bond of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the awarding authority in the full sum of the subcontract price.

E. The names of all persons, firms and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the provisions of the section of the Specifications for this sub-trade require a listing in this paragraph, including the undersigned if customarily furnished by persons on his own payroll and in the absence of a contrary provision in the Specifications, the name of each such class of work or part thereto and the bid price for such class of work or part thereof are:

<table>
<thead>
<tr>
<th>NAME</th>
<th>CLASS OF WORK</th>
<th>BID PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(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>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td></td>
<td></td>
<td></td>
</tr>
</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: __________
STANDARD VERTICAL CONSTRUCTION CONTRACT
For Projects Over $25,000 Subject to M.G.L. 149, s. 44A -F

OWNER - CONTRACTOR AGREEMENT

Awarding Authority: ____________________________
Department Code: ___ ___ ___

This agreement ("Contract") is made as of the ___ day of __________, 20___, by and between the Commonwealth of Massachusetts acting by and through the Awarding Authority identified above with a principal place of business at
__________________________________________________________________________
and ________________________________________________________________ , a
__________________________ with a principal place of business at
__________________________________________________________________________,
__________________________________________________________________________ , hereinafter called the "Contractor".

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

The Awarding Authority and the Contractor agree as follows:
Article 1. Scope of Work. The Work under this Contract is defined as all work required by the Contract Documents for the construction of ___________________________,

UMA Number ___________________________,

Project Number ___________________________, in accordance with and as described in the Plans and Specifications dated ___________________________, 20____, prepared by ___________________________ (“Designer”), as modified by Addenda Nos. ___________________________ dated ___________________________, 20____.

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

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 applicable minority workforce utilization percentage, if any is ____________.
The applicable women workforce utilization percentage, if any is ____________.

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:

$2500.00 per day

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

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

By: ____________________________________________

Name: __________________________________________

Title: ___________________________________________

Date: ___________________________________________

AWARDING AUTHORITY:

By executing this Agreement, the undersigned authorized signatory of the Awarding Authority, who incurs no personal liability by reason of the execution hereof or anything herein contained, hereby certifies under penalties of perjury that this Contract is executed in accordance with a prior approval of the 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: ____________________________________________

Name: __________________________________________

Title: ________Vice Chancellor for Administration & Finance_____

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 ____________________________________________________________

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

__________________________________________________________

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 ____________________________, 20____, for construction of

UMA Number _______________________________________________________________

Project Name _______________________________________________________________

Now the condition of this obligation is such that if the principal shall pay for all labor performed or furnished and for all materials used or employed in said Contract and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said Contract that may hereafter be made, notice to the surety of such 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

__________________________________________, 20__.

_________________________________________ (Seal)  __________________________________________ (Seal)

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

By __________________________________________ ________________________________

(Signature – Title)  (Signature – Title)

Surety Address ____________________________________________

__________________________________________
PERFORMANCE BOND

Know all men by these presents, that

as principal, and ________________________________

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

______________________________

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 _____________________________, 20____, for construction of

UMA Number ________________________________

Project Name ________________________________

Now the condition of this obligation is such that if the principal shall well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of said Contract and any extensions thereof that may be granted by the 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 _____________ day of _____________________________, 20__. 
(Print Name of General Contractor)  (Print Name of Surety)

By _____________________________  _____________________________

(Signature – Title)  (Signature – Title)

Surety Address _____________________________

____________________________________________________________________

Countersigned Mass. Resident Agent By: ________________________________

Agent’s Address: _____________________________________________________

Telephone Number: ___________________________________________________
**SCHEDULE FOR PARTICIPATION**

**BY MINORITY/WOMEN BUSINESS ENTERPRISES**

**UNIVERSITY OF MASSACHUSETTS AMHERST**

UMA Number _17-05_  
Project Location ____________________________________________________________

Project Name  
________________________________________________________________________

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.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MBE Goal: $__________

Total Dollar Value of MBE Commitment: $__________

WBE Goal: $__________

Total Dollar Value of WBE Commitment: $__________

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

Name of General Contractor ____________________________________________________________

Business Address ________________________________________________________________

Name (print) ________________________________________________________________

Title ________________________________________________________________

Authorized Signature ________________________________________________________________

Telephone No. __________________________ Fax No. __________________________

Date __________________________
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_________________________ Indicate SOMWBA Certification:

Project Name ____________________________ ☐ MBE

Project Location ___________________________ ☐ WBE

To_______________________________________ ☐ M/WBE

Name of General Bidder/ Sub-bidder

1. This firm intends to perform work in connection with the above project.

2. This firm is currently certified by SOMWBA to perform the work identified below, and has not changed its minority/women ownership, control, or management without notifying SOMWBA within thirty (30) days of such a change.

3. This firm understands that if the General Bidder/Sub-bidder referenced above is awarded the contract, the Bidder intends to enter into an agreement with this firm to perform the activity described below for the prices indicated. This firm also understands that the above-referenced firm, as General Bidder/Sub-bidder, will make substitutions only as allowed by Article XIII of the Contract.

4. This firm understands that under the terms of Article XIII of the contract, only work actually performed by an MBE/WBE will be credited toward MBE/WBE participation goals, and this firm cannot assign or subcontract out any of its work without prior written approval of the DCAM Compliance Office, and that any such assignment or subcontracting will not be credited toward MBE/WBE participation goals.
## MBE/WBE PARTICIPATION

<table>
<thead>
<tr>
<th>Section/Item Number (if applicable)</th>
<th>Describe MBE/WBE Scopes of Work (clarify “Labor Only”, “Material Only” or “Labor and Material”)</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></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Dollar Value:**

$_____________________________

Name of MBE/WBE Firm____________________________

Authorized Signature____________________________

Business Address____________________________

Print Name____________________________

_________________________________________________________________________________

Title____________________________

Telephone No_____________________________ Fax No._____________________________

Date________________________________________

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

_____________________, 20_____

I hereby certify that I am the _______________ clerk, ____________________, assistant clerk, of _______________________________(the “Corporation”) and that at a

(Name of Corporation)
duly authorized meeting of the Board of Directors of the Corporation held on

_____________________, ______, 20_____

in _______________________________ a which a quorum

(Date) (Location)
was present and voting it was voted to authorize _______________________________

(Name)
_____________________________ of the Corporation to execute

(Officer Title)
and deliver on behalf of the Corporation the following contract and to act as principal to execute bonds in connection therewith, which contract and bonds were presented to and made a part of the records of said meeting:

UMA Number ___________________

Project Title: _______________________________

I further certify that _______________________________ is duly qualified and acting

(Name of Corporate Officer)
_____________________________ of the Corporation and that said vote

(Officer Title)
has not been repealed, rescinded or amended.

___________________________

Name

___________________________

Date

(CORPORATE SEAL)

SUBSCRIBED AND SWORN TO THIS _____DAY OF __________, 20______ BEFORE ME

___________________________

Notary Public

My Commission Expires: ___________________
CERTIFICATE OF JOINT VENTURE
(INCLUDING SIGNATURE AUTHORITY)

This certificate is being given in connection with the execution by

__________________________________________ (the “Joint Venture”) of the following construction contract with
the 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.
5. No changes in the Management Committee of the Joint Venture shall be effective without the written consent of the Director of Facilities Planning, University of Massachusetts Amherst.
6. No amendments to the Joint Venture Agreement shall be effective without the written consent of the Director of Facilities Planning, University of Massachusetts Amherst.
7. By executing this certificate

[signature]

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

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

[signature]

By: [signature], a Massachusetts corporation having a principal place of business at [address]

[signature]

By: [signature], its general partner

[signature]

By: [signature], its general partner

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

________________________________________________ whose principal place of business is at

________________________________________________

________________________________________________

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

The Business Organization Social Security Number or Federal Identification Number is

______________________________________.

Signed under the penalties of perjury the _____________ day of _____________, 20____.

Signature:________________________________________

Name:____________________________________________

Title:_____________________________________________
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: ________________________________________________________________

I, ______________________________, authorized signatory for__
( Print Name)

Company whose principal place of business is at
__________________________________________________________

(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: __________________________  Project Number: __________________________

Project Title: ________________________________________________________________________

The Company Social Security No. or Federal Identification No. is: __________________________

Signed under pains and penalties of perjury the _________ day of _____________, 20_____

Signature: _______________________________________________________________________

Name and Title: ____________________________________________________________________
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 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
  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 (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)
  Certificate of Agency Use and Occupancy – E-1
  Certificate of Final Inspection, Release and Acceptance – E-2
  Form ST-5C
GENERAL CONDITIONS OF THE CONTRACT

TABLE OF CONTENTS

ARTICLE I: DEFINITION OF TERMS -- p. 92

ARTICLE II: EXECUTION OF THE CONTRACT, SCOPE OF WORK, INTERPRETATION OF CONTRACT DOCUMENTS -- p. 95

1. Execution -- p. 95
2. Scope of Work -- p. 95
3. Interpretation -- p. 96
4. Distribution of Work -- p. 96
5. Contract Price -- p. 96

ARTICLE III: CONTROL OF WORK / ADMINISTRATION OF THE CONTRACT -- p. 97

1. Designer -- p. 97
2. Right of Access to Work -- p. 97
3. Inspection No Waiver -- p. 97

ARTICLE IV: GENERAL PERFORMANCE OBLIGATIONS OF THE CONTRACTOR -- p. 98

1. Review of Contract Documents and Field Conditions -- p. 98
2. Supervision and Construction Procedures; Coordination; Cutting, and Patching -- p. 98
3. Superintendent -- p. 99
4. Labor -- p. 99
5. Notices and Permits -- p. 100
6. Lines, Marks Etc. -- p. 100
7. Excavation -- p. 101
9. Corrections to The Work; Inspection No Bar To Subsequent Corrections -- p. 101
10. Sanitary Facilities -- p. 101
11. Contract Documents at the Site -- p. 102
12. Telephones -- p. 102
13. Health, Safety and Accident Prevention -- p. 103
14. Debris and Chemical Waste -- p. 105
15. Weather Protection -- p. 106
16. Furnishings and Equipment -- p. 106
17. Form for Sub-Contract -- p. 106
18. Sales Tax Exemption and Other Taxes -- p. 106
19. Final Cleaning -- p. 107
20. Maintenance Data -- p. 107
22. Risk of Loss -- p. 108
23. LEED Requirements -- p. 108

ARTICLE V: MATERIALS AND EQUIPMENT -- p. 108

1. Materials Generally --p. 108
2. Shop Drawings, Product Data, and Samples -- p. 109
3. Tests -- p. 110
4. "Or Equal" Submissions -- p. 110
5. Delivery and Storage of Materials; Inspection -- p. 111
6. Defective, Damaged, Deteriorated Materials and Rejection Thereof - p. 112

ARTICLE VI: PROSECUTION AND PROGRESS -- p. 113

1. Beginning, Progress Schedule, and Completion of Work -- p. 113
2. Failure To Complete Work On Time - Liquidated Damages -- p. 114
3. Delays; Statutory Provisions -- p. 115
4. Use and Occupancy Prior To Final Acceptance-- p. 116
5. Certificate of Agency Use and Occupancy -- p. 116
6. Final Acceptance of the Work -- p. 118
7. One Year Warranty Repair List and Inspection -- p. 119
ARTICLE VII: CHANGES IN THE WORK -- p. 119

1. Change Orders Generally -- p. 119
2. Methods of Computing Equitable Adjustments -- p. 120
3. Work Performed Under Protest -- p. 121
4. False Claims, Statutory Provisions Regarding Changes -- p. 121
5. Mandatory Mediation -- p. 123

ARTICLE VIII: PAYMENT PROVISIONS -- p. 124

1. Schedule of Values -- p. 124
2. Payment Liabilities of the Contractor -- p. 124
3. Retention of Moneys by Awarding Authority -- p. 125
4. Applications for Payment -- p. 125
5. Periodic Payments (M.G. L. c. 30, s. 39K) -- p. 127
6. Payment of Subcontractors (M.G.L. c. 30, s. 39F) -- p. 129
7. Contracts for Public Works governed by M.G.L. c. 30, s. 39G -- p. 132
8. Final Payment; Release of Claims by Contractor -- p. 134

ARTICLE IX: GUARANTEES AND WARRANTIES -- p. 134

1. General Warranty -- p. 135
2. Special Guarantees and Warrantees -- p. 135

ARTICLE X: MISCELLANEOUS LEGAL REQUIREMENTS -- p. 135

1. Contractor to Be Informed -- p. 135
2. Compliance with All Laws -- p. 135

ARTICLE XI: CONTRACTOR'S ACCOUNTING METHOD REQUIREMENTS (M.G.L. c. 30, s. 39R) -- p. 139

1. Definitions -- p. 139
2. Record Keeping -- p. 140
3. Statement of Management Controls -- p. 140
4. Annual Financial Statement -- p. 141
5. Bid Pricing Materials -- p. 141

ARTICLE XII: EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM -- p. 142 (See Appendix A)
ARTICLE XIII: GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES (EXECUTIVE ORDER 390) -- p. 142 (See Appendix B)

ARTICLE XIV: INSURANCE REQUIREMENTS -- p. 142

1. Insurance Generally -- p. 142
2. Contractor’s Commercial General Liability -- p. 143
3. Vehicle Liability -- p. 143
4. Pollution Liability -- p. 144
5. Worker’s Compensation -- p. 144
7. Umbrella Coverage -- p. 145
8. Additional Types of Insurance -- p. 145

ARTICLE XV: INDEMNIFICATION -- p. 145

1. Generally -- p. 145
2. Designer’s Action -- p. 146
3. Survival -- p. 146

ARTICLE XVI: PERFORMANCE AND PAYMENT BONDS -- p. 146

1. Contractor Bonds -- p. 146
2. Subcontractor Bonds -- p. 147

ARTICLE XVII: TERMINATION OF THE CONTRACT -- p. 147

1. Termination for Cause -- p. 147
2. Termination for Convenience -- p. 149
3. Contractor’s Duties upon Termination for Convenience -- p. 149

ARTICLE XVIII: MISCELLANEOUS PROVISIONS -- p. 149

1. No Assignment by Contractor -- p. 149
2. Non-Appropriation -- p. 149
3. Claims by Others Not Valid -- p. 150
4. No Personal Liability by Public Officials -- p. 150
5. Severability -- p. 150
6. Choice of Laws -- p. 150
7. Standard Forms -- p. 150

89
8. No Waiver of Subsequent Breach -- p. 150
9. Remedies Cumulative -- p. 150
10. Notices -- p. 151

APPENDIX A -- EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM -- p. 152

1. Compliance Generally -- p. 152
2. Non-Discrimination and Affirmative Action -- p. 152
3. Liaison Committee, Reports and Records -- p. 153
4. Sanctions -- p. 154

APPENDIX B -- GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES (EXECUTIVE ORDER 390) -- p. 156

1. Goals -- p. 156
2. M/WBE Participation Credit -- p. 156
3. Establishing M/WBE Status -- p. 157
4. Subcontractors With M/WBEs -- p. 157
5. Performance of Contract Work by M/WBEs -- p. 157
7. Actions Required If There Is A Reduction in M/WBE Participation -- p. 158
8. Suspension of Payment and/or Performance for Noncompliance -- p. 159
9. Liquidated Damages; Termination -- p. 159
10. Reporting Requirements -- p. 159
11. Awarding Authority's Right to Waive Provision of this Article in Whole or in Part -- p. 160

APPENDIX C -- COMMONLY USED FORMS -- p. 161
Procedure for Payment to Contractors
Payment Voucher Input Form
Requisition for Payment
Monthly Requisition Breakdown (DCAM Form 55)
Instructions Regarding Change Orders and Contract Modifications (DCAM Form 13)
Daily Time and Material Report for Change Orders
Request and Agreement for a Change in the Plans,
Specifications and/or Contract (DCAM Form 5)
Notice of Intent
Contractor’s Weekly Workforce Report
Minorities/Women in Contractor’s Weekly Workforce Report

90
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.

**Timothy Murphy Architects - Timothy Murphy 413-532-7464**

**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.

Rebecca Ducharme 413-834-3832

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:

1. **Review of Contract Documents and Field Conditions.**
   
   A. Before commencing the Work, the Contractor shall carefully study the Contract Documents and carefully compare all Specifications, Plans, Drawings, figures, dimensions, lines, marks, scales, directions of the Designer, and any other information provided by the Awarding Authority and shall at once report to the Designer any questions, errors, inconsistencies, or omissions.
   
   B. Before commencing the Work, the Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents and shall at once report to the Designer any questions, errors, inconsistencies, or omissions.

2. **Supervision and Construction Procedures; Coordination; Cutting, and Patching.**
   
   A. The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and shall have control over, construction means, methods, techniques, sequences and procedures, and shall be responsible for coordinating all portions of the Work under the Contract.
   
   B. The Contractor shall be responsible for the proper fitting of all Work and the coordination of the operations of all trades, Subcontractors, and 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.

**5. Notices and Permits.**

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

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

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

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

**6. Lines, Marks etc.**

The Contractor shall furnish batter boards and stakes and shall cause to be placed and maintained thereon so as to be easily read, such lines, marks and directions relating to the Work as the Designer shall from time to time direct. The Designer shall establish base lines and benchmarks on the Drawings for the locations of the Work but all other lines and grades shall be determined by the Contractor.
7. **Excavation.**
The Contractor shall prevent by sheeting and shoring or bracing, if necessary, any caving or bulging of the sides of any excavation made by the Contractor, leaving sheeting and shoring in place, or if any is removed, filling solid the spaces left thereby.

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

9. **Corrections to the Work; Inspection No Bar to Subsequent Corrections.**
The Designer's inspection of the Work shall not relieve the Contractor of its responsibilities to fulfill the Contract obligations. Defective work may be rejected by the Designer whether or not such work and/or materials have been previously overlooked or misjudged by the Designer and accepted for payment. If the Work or any part thereof shall be found defective at any time before the Final Acceptance of the whole Work, the Contractor shall forthwith cease the performance of any defective work in progress and, whether or not such work is still in progress, shall forthwith correct such defect in a manner satisfactory to the Designer. If any material brought upon the Site for use in the Work, or selected for the same, shall be rejected by the Designer as unsuitable or not in conformity with the Contract Documents, or as damaged by casualty or deteriorated due to improper storage at the Site or to any other factor, the Contractor shall forthwith remove such materials from the Site. The Contractor shall pay for the cost of making good all work or property of other contractors or of the Owner destroyed or damaged by such removal or replacement; repair any injury, defect, omission or mistake in the Work as soon as it is discovered; finish and immediately make good any defect, omission or mistake in the Work; and complete and leave the Work in perfect condition.

10. **Sanitary Facilities.**
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."

108
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. 390).

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. 390 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 incompletion 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 said notice, to the chief executive official of the Awarding Authority or his designee, and the Contractor shall have the right to such further appeal as is provided in M.G.L. c.30, s. 39Q set forth in Section 4.D of this Article VII. However, if the Contractor shall exercise its rights to appeal the decision of the Awarding Authority as aforesaid, the Contractor shall be required to engage in the mandatory mediation procedures set forth in Section 5 of this Article VII.
   
   F. During the negotiation of an equitable adjustment in the Contract Price, the Contractor shall, if requested, provide the Awarding Authority with all cost and pricing data used by him in computing the amount of the equitable adjustment, and the Contractor shall certify that the
pricing data used was accurate, complete and current. If the Awarding Authority subsequently determines that the data submitted by the Contractor was incomplete, incorrect or not current, the Awarding Authority may exclude such data from consideration under the equitable adjustment request.

   
   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-42l. 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 rediscount 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 (1) 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 d 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 ¾. 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
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 AND AFFIRMATIVE ACTION PROGRAM.

This Contract includes the provisions of the Awarding Authority's "Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program" attached as Appendix A to these General Conditions of the Contract and incorporated herein by reference.

ARTICLE XIII: GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES

This Contract includes the provisions of the Awarding Authority's program relating to Goals for Participation by Minority Business Enterprises and Women Business Enterprises attached as Appendix B to these General Conditions of the Contract and incorporated herein by reference.

ARTICLE XIV: INSURANCE REQUIREMENTS

1. Insurance Generally.
   A. The Contractor shall 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 time 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:

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

   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:

   - Combined Single Limit
     - $1,000,000

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

<table>
<thead>
<tr>
<th>Coverage Type</th>
<th>Minimum Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worker's Compensation</td>
<td>Provide Statutory Minimum</td>
</tr>
<tr>
<td>Part One</td>
<td>$500,000 each accident</td>
</tr>
<tr>
<td>Employer's Liability</td>
<td>$500,000 disease per employee</td>
</tr>
<tr>
<td>Part Two</td>
<td>$500,000 disease policy aggregate</td>
</tr>
</tbody>
</table>

   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>$1,000,000 -- $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.
10. **Notices.**

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

The following provisions form Article XII of the General Conditions of the Contract where 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 Verdians; "Commission" refers to the Massachusetts Commission Against Discrimination. During the performance of this Contract, the Contractor and all of its Subcontractors (hereinafter collectively referred to as the Contractor) shall comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

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

   B. The Contractor shall comply with the provisions of Executive Order 478, entitled Order Regarding Nondiscrimination, Diversity, Equal Opportunity and Affirmative Action, which prohibits unlawful discrimination based on race, color, age, gender, ethnicity, sexual orientation, religion, creed, ancestry, national origin, disability, veteran’s status (including Vietnam-era veterans), or background. Executive Order 478 is herein incorporated by reference and made a part of this Contract.

   Pursuant to Executive Order 478 the Contractor and any subcontractors may not engage in discriminatory employment practices; and the Contractor must certify that it is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and commit to purchasing supplies and services from certified minority or women-owned businesses, small businesses, or businesses owned by socially or economically disadvantaged persons or persons with disabilities. These provisions shall be enforced through the contracting agency, the Operational Services Division, and/or the Massachusetts Commission Against Discrimination. Any breach shall be regarded as a material breach of Contract that may subject Contractor to appropriate sanctions. The Contractor shall comply with the provisions of Executive Order No. 246 entitled Revoking and Superseding Executive Orders Numbers 143 and 150, with respect to affirmative action programs for handicapped individuals, which is herein incorporated by reference and made a part of this Contract.

152
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.

6. **Notification of Changes in M/WBE 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-5C
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 staggering 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
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 subcontractors 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

<table>
<thead>
<tr>
<th>Trade</th>
<th>Name of Worker</th>
<th>Hrs</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

165
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: ________________________________________________________

166
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 ____________________________________________________________
Firm Name ___________________________ by _______________________________
Authorized Signature ___________________________ Date ______________________

III. APPROVAL RECOMMENDED BY:

The Designer and the Resident Engineer must attach their respective letters of recommendation with responses to questions listed in Form 13,
change order instructions. Adverse or altered recommendation must be delineated on the letters.

Resident Engineer ___________________________ Date ______________________
Project Engineer ___________________________ Date ______________________
Project Manager ___________________________ Date ______________________
Deputy Director ___________________________ Date ______________________

IV. APPROVED BY THE OFFICE
(a) Operating Agency Letter (attached) _______ (not req'd) _______________________
(b) For the amount requested/or corrected to $ ________________________________
   © Extended as requested/or corrected to _______ Calendar Days.
   (d) This change is in the best interest of the Commonwealth and constitutes an
       equitable adjustment to the contract in compliance with Art. VII of the contract.

Authorized Signature ___________________________ Date ______________________

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

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, SUBSTITUTIONS 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 filed sub-contractors shall be separated
      from the General Contractor’s breakdown and both are required to be on properly
      identifiable letterhead stationary and signed showing (a) quantities and costs utilizing unit
      pricing, (b) the classification and hours of labor, fringe benefits and the complete
      breakdown showing unit cost of material and equipment, and (c) any other allowable costs
      as set forth in Article VII. See also Section 5, below.
b) The written request for 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 DIRECTIONF FOR COMPUTING COSTS FOR CHANGES IN WORK

5.01 SHIPPING, STORAGE AND HANDLING COSTS AND MATERIALS AND EQUIPMENT INVOLVED IN A CHANGE IN WORK MAY BE INCLUDED IN THE COSTS FOR CHANGE, IF ITEMIZED AND ACCOMPANIED BY COPIES OF PAID INVOICES.


5.03 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 ______________
<table>
<thead>
<tr>
<th>Job Category</th>
<th>Number of Employees</th>
<th>Number of Employees Who Are</th>
<th>Total Weekly Workforce Hours</th>
<th>Total Weekly Workforce Hours</th>
<th>Weekly % Workforce Hours</th>
<th>Total Workforce Hours To Date</th>
<th>Total Workforce Hours To Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTALS:**

**UMA No.** ____________  **Project Name** _________________________________________________  **General Contractor** ____________________________

Mail to: University of Massachusetts, Amherst  The undersigned hereby certifies under pains and penalties of perjury that the above
Facilities Planning/Contract Manager  information is true and accurate.
Physical Plant Building
360 Campus Center Way  Authorized Signature _______________________ Date ______________________
Amherst, MA 01003

Print Name ___________________________ Telephone No. ________________

Title __________________________________ Fax No. ____________________

Contractor’s Weekly Workforce Report - Revised 10/01

180
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>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Minorities/Women in Contractor’s Weekly Workforce Report - Revised 10/01
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>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</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
Awarding Authority: University of Massachusetts Amherst

Contract Number: UMA17-05

City/Town: AMHERST

Description of Work: Southwest Tower Doors & Lowrise Lounges Works

Job Location: UMASS Amherst

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</th>
<th>Total Rate</th>
</tr>
</thead>
<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>
<td>$32.15</td>
<td>$10.91</td>
<td>$10.89</td>
<td>$0.00</td>
<td>$53.95</td>
</tr>
<tr>
<td>(3 AXLE) DRIVER - EQUIPMENT</td>
<td>08/01/2016</td>
<td>$32.22</td>
<td>$10.91</td>
<td>$10.08</td>
<td>$0.00</td>
<td>$53.21</td>
</tr>
<tr>
<td>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</td>
<td>12/01/2016</td>
<td>$32.22</td>
<td>$10.91</td>
<td>$10.89</td>
<td>$0.00</td>
<td>$54.02</td>
</tr>
<tr>
<td>(4 &amp; 5 AXLE) DRIVER - EQUIPMENT</td>
<td>08/01/2016</td>
<td>$32.34</td>
<td>$10.91</td>
<td>$10.08</td>
<td>$0.00</td>
<td>$53.33</td>
</tr>
<tr>
<td>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</td>
<td>12/01/2016</td>
<td>$32.34</td>
<td>$10.91</td>
<td>$10.89</td>
<td>$0.00</td>
<td>$54.14</td>
</tr>
<tr>
<td>ADS/SUBMERSIBLE PILOT</td>
<td>08/01/2015</td>
<td>$90.51</td>
<td>$9.80</td>
<td>$18.17</td>
<td>$0.00</td>
<td>$118.48</td>
</tr>
<tr>
<td>PILE DRIVER LOCAL 56 (ZONE 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIR TRACK OPERATOR</td>
<td>06/06/2016</td>
<td>$29.90</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.75</td>
</tr>
<tr>
<td>LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td>12/05/2016</td>
<td>$30.58</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$50.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIR TRACK OPERATOR (HEAVY &amp; HIGHWAY)</td>
<td>06/01/2016</td>
<td>$29.75</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.72</td>
</tr>
<tr>
<td>LABORERS - ZONE 3 (HEAVY &amp; HIGHWAY)</td>
<td>12/01/2016</td>
<td>$30.50</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$48.47</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASBESTOS WORKER (PIPES &amp; TANKS)</td>
<td>06/01/2016</td>
<td>$29.61</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$47.71</td>
</tr>
<tr>
<td>HEAT &amp; FROST INSULATORS LOCAL 6 (SPRINGFIELD)</td>
<td>12/01/2016</td>
<td>$30.51</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$48.61</td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$31.41</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$49.51</td>
<td></td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$32.31</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$50.41</td>
<td></td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$33.21</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$51.31</td>
<td></td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$34.11</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$52.21</td>
<td></td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$35.01</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$53.11</td>
<td></td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$35.91</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$54.01</td>
<td></td>
</tr>
<tr>
<td>06/01/2020</td>
<td>$36.81</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$54.91</td>
<td></td>
</tr>
<tr>
<td>12/01/2020</td>
<td>$37.71</td>
<td>$11.50</td>
<td>$6.60</td>
<td>$0.00</td>
<td>$55.81</td>
<td></td>
</tr>
<tr>
<td>ASPHALT RAKER</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>
</tr>
<tr>
<td>LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td>12/05/2016</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASPHALT RAKER (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>
<tr>
<td>LABORERS - ZONE 3 (HEAVY &amp; HIGHWAY)</td>
<td>12/01/2016</td>
<td>$30.00</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.97</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUTOMATIC GRADER-EXCAVATOR (RECLAIMER)</td>
<td>06/01/2016</td>
<td>$33.38</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.77</td>
</tr>
<tr>
<td>OPERATING ENGINEERS LOCAL 98</td>
<td>12/01/2016</td>
<td>$33.78</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.64</td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$34.39</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$57.52</td>
<td></td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$34.99</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$58.39</td>
<td></td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$35.60</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$59.27</td>
<td></td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$36.20</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$60.14</td>
<td></td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$36.71</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.92</td>
<td></td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$37.31</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.79</td>
<td></td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- PILE DRIVER"

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

For apprentice rates see "Apprentice- OPERATING ENGINEERS"
<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>BACKHOE/FRONT-END LOADER OPERATOR</td>
<td>06/01/2016</td>
<td>$33.38</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.77</td>
</tr>
<tr>
<td>OPERATING ENGINEERS LOCAL 98</td>
<td>12/01/2016</td>
<td>$33.78</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.64</td>
</tr>
<tr>
<td></td>
<td>06/01/2017</td>
<td>$34.39</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$57.52</td>
</tr>
<tr>
<td></td>
<td>12/01/2017</td>
<td>$34.99</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$58.39</td>
</tr>
<tr>
<td></td>
<td>06/01/2018</td>
<td>$35.60</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$59.27</td>
</tr>
<tr>
<td></td>
<td>12/01/2018</td>
<td>$36.20</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$60.14</td>
</tr>
<tr>
<td></td>
<td>06/01/2019</td>
<td>$36.71</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.92</td>
</tr>
<tr>
<td></td>
<td>12/01/2019</td>
<td>$37.31</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.79</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></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>
</tr>
<tr>
<td>BARCO-TYPE JUMPING TAMPER</td>
<td>12/05/2016</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
<tr>
<td>LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>06/01/2016</td>
<td>$32.85</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.24</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$33.25</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.11</td>
</tr>
<tr>
<td></td>
<td>06/01/2017</td>
<td>$33.86</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$56.99</td>
</tr>
<tr>
<td></td>
<td>12/01/2017</td>
<td>$34.46</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$57.86</td>
</tr>
<tr>
<td></td>
<td>06/01/2018</td>
<td>$35.07</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$58.74</td>
</tr>
<tr>
<td></td>
<td>12/01/2018</td>
<td>$35.67</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$59.61</td>
</tr>
<tr>
<td></td>
<td>06/01/2019</td>
<td>$36.18</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.39</td>
</tr>
<tr>
<td></td>
<td>12/01/2019</td>
<td>$36.78</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>06/06/2016</td>
<td>$29.90</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.75</td>
</tr>
<tr>
<td>BLOCK PAVER, RAMMER / CURB SETTER</td>
<td>12/05/2016</td>
<td>$30.58</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$50.43</td>
</tr>
<tr>
<td>LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>06/01/2016</td>
<td>$29.75</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.72</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$30.50</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$48.47</td>
</tr>
<tr>
<td>BLOCK PAVER, RAMMER / CURB SETTER (HEAVY &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGHWAY)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LABORERS - ZONE 3 (HEAVY &amp; HIGHWAY)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>01/01/2016</td>
<td>$41.62</td>
<td>$6.97</td>
<td>$16.21</td>
<td>$0.00</td>
<td>$64.80</td>
</tr>
<tr>
<td>BOILER MAKER</td>
<td>01/01/2017</td>
<td>$42.92</td>
<td>$6.97</td>
<td>$16.21</td>
<td>$0.00</td>
<td>$66.10</td>
</tr>
</tbody>
</table>
### BOILERMakers - Local 29

#### Apprentice - 01/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>65</td>
<td>$27.05</td>
<td>$6.97</td>
<td>$10.54</td>
<td>$0.00</td>
<td>$44.56</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>$27.05</td>
<td>$6.97</td>
<td>$10.54</td>
<td>$0.00</td>
<td>$44.56</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$29.13</td>
<td>$6.97</td>
<td>$11.35</td>
<td>$0.00</td>
<td>$47.45</td>
</tr>
<tr>
<td>4</td>
<td>75</td>
<td>$31.22</td>
<td>$6.97</td>
<td>$12.16</td>
<td>$0.00</td>
<td>$50.35</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>$33.30</td>
<td>$6.97</td>
<td>$12.97</td>
<td>$0.00</td>
<td>$53.24</td>
</tr>
<tr>
<td>6</td>
<td>85</td>
<td>$35.38</td>
<td>$6.97</td>
<td>$13.78</td>
<td>$0.00</td>
<td>$56.13</td>
</tr>
<tr>
<td>7</td>
<td>90</td>
<td>$37.46</td>
<td>$6.97</td>
<td>$14.59</td>
<td>$0.00</td>
<td>$59.02</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>$39.54</td>
<td>$6.97</td>
<td>$15.40</td>
<td>$0.00</td>
<td>$61.91</td>
</tr>
</tbody>
</table>

#### Effective Date - 01/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>65</td>
<td>$27.90</td>
<td>$6.97</td>
<td>$10.54</td>
<td>$0.00</td>
<td>$45.41</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>$27.90</td>
<td>$6.97</td>
<td>$10.54</td>
<td>$0.00</td>
<td>$45.41</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$30.04</td>
<td>$6.97</td>
<td>$11.35</td>
<td>$0.00</td>
<td>$48.36</td>
</tr>
<tr>
<td>4</td>
<td>75</td>
<td>$32.19</td>
<td>$6.97</td>
<td>$12.16</td>
<td>$0.00</td>
<td>$51.32</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>$34.34</td>
<td>$6.97</td>
<td>$12.97</td>
<td>$0.00</td>
<td>$54.28</td>
</tr>
<tr>
<td>6</td>
<td>85</td>
<td>$36.48</td>
<td>$6.97</td>
<td>$13.78</td>
<td>$0.00</td>
<td>$57.23</td>
</tr>
<tr>
<td>7</td>
<td>90</td>
<td>$38.63</td>
<td>$6.97</td>
<td>$14.59</td>
<td>$0.00</td>
<td>$60.19</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>$40.77</td>
<td>$6.97</td>
<td>$15.40</td>
<td>$0.00</td>
<td>$63.14</td>
</tr>
</tbody>
</table>

#### Notes:

Apprentice to Journeyworker Ratio: 1:5

---

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

<table>
<thead>
<tr>
<th>Issue Date: 10/20/2016</th>
<th>Wage Request Number: 20161020-031</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/05/2016</td>
<td>$39.26 $10.18 $17.38 $0.00 $66.82</td>
</tr>
<tr>
<td>02/27/2017</td>
<td>$39.83 $10.18 $17.38 $0.00 $67.39</td>
</tr>
<tr>
<td>Classification</td>
<td>Effective Date</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Springfield/Pittsfield</strong></td>
<td>09/05/2016</td>
</tr>
<tr>
<td>Step</td>
<td>percent</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td><strong>Effective Date - 02/27/2017</strong></td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>percent</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
</tr>
</tbody>
</table>

**Notes:**

Apprentice to Journeyworker Ratio: 1:5

---

**BULLDOZER/POWER SHOVEL/TREE SHREDDER /CLAM SHELL OPERATING ENGINEERS LOCAL 98**

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<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><strong>CAISSON &amp; UNDERPINNING BOTTOM MAN LABORERS - FOUNDATION AND MARINE</strong></td>
<td>06/01/2016</td>
<td>$33.38</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.77</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$33.78</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.64</td>
</tr>
<tr>
<td></td>
<td>06/01/2017</td>
<td>$34.39</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$57.52</td>
</tr>
<tr>
<td></td>
<td>12/01/2017</td>
<td>$34.99</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$58.39</td>
</tr>
<tr>
<td></td>
<td>06/01/2018</td>
<td>$35.60</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$59.27</td>
</tr>
<tr>
<td></td>
<td>12/01/2018</td>
<td>$36.20</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$60.14</td>
</tr>
<tr>
<td></td>
<td>06/01/2019</td>
<td>$36.71</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.92</td>
</tr>
<tr>
<td></td>
<td>12/01/2019</td>
<td>$37.31</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.79</td>
</tr>
</tbody>
</table>

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><strong>CAISSON &amp; UNDERPINNING LABORER LABORERS - FOUNDATION AND MARINE</strong></td>
<td>06/01/2016</td>
<td>$35.80</td>
<td>$7.45</td>
<td>$14.00</td>
<td>$0.00</td>
<td>$57.25</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$36.80</td>
<td>$7.45</td>
<td>$14.00</td>
<td>$0.00</td>
<td>$58.25</td>
</tr>
</tbody>
</table>

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><strong>CAISSON &amp; UNDERPINNING TOP MAN LABORERS - FOUNDATION AND MARINE</strong></td>
<td>06/01/2016</td>
<td>$35.80</td>
<td>$7.45</td>
<td>$14.00</td>
<td>$0.00</td>
<td>$57.25</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$36.80</td>
<td>$7.45</td>
<td>$14.00</td>
<td>$0.00</td>
<td>$58.25</td>
</tr>
</tbody>
</table>

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><strong>CARBIDE CORE DRILL OPERATOR LABORERS - ZONE 3 (BUILDING &amp; SITE)</strong></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>
</tr>
<tr>
<td></td>
<td>12/05/2016</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
</tbody>
</table>

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><strong>CARPENTER CARPENTERS LOCAL 108 - HAMPDEN HAMPSHIRE</strong></td>
<td>02/29/2016</td>
<td>$32.60</td>
<td>$8.55</td>
<td>$14.72</td>
<td>$0.00</td>
<td>$55.87</td>
</tr>
</tbody>
</table>
### CARPENTER - Local 108 Hampden Hampshire

**Apprentice -**

<table>
<thead>
<tr>
<th>Step</th>
<th>02/29/2016</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$16.30</td>
<td>$8.55</td>
<td>$1.20</td>
<td>$0.00</td>
<td>$26.05</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>$19.56</td>
<td>$8.55</td>
<td>$1.20</td>
<td>$0.00</td>
<td>$29.31</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$22.82</td>
<td>$8.55</td>
<td>$11.12</td>
<td>$0.00</td>
<td>$42.49</td>
</tr>
<tr>
<td>4</td>
<td>75</td>
<td>$24.45</td>
<td>$8.55</td>
<td>$11.12</td>
<td>$0.00</td>
<td>$44.12</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>$26.08</td>
<td>$8.55</td>
<td>$12.32</td>
<td>$0.00</td>
<td>$46.95</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>$26.08</td>
<td>$8.55</td>
<td>$12.32</td>
<td>$0.00</td>
<td>$46.95</td>
</tr>
<tr>
<td>7</td>
<td>90</td>
<td>$29.34</td>
<td>$8.55</td>
<td>$13.52</td>
<td>$0.00</td>
<td>$51.41</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$29.34</td>
<td>$8.55</td>
<td>$13.52</td>
<td>$0.00</td>
<td>$51.41</td>
</tr>
</tbody>
</table>

**Effective Date -**

### CEMENT MASONRY/PLASTERING

BRICKLAYER'S LOCAL 3 (SPRINGFIELD/PITTSFIELD)

**Apprentice -**

<table>
<thead>
<tr>
<th>Step</th>
<th>01/01/2016</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

**Effective Date -**

### CEMENT MASONRY/PLASTERING - Springfield/Pittsfield

**Apprentice -**

<table>
<thead>
<tr>
<th>Step</th>
<th>01/01/2016</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

**Notes:** Apprentice wages shall be no less than the following Steps:

1 $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.

### CHAIN SAW OPERATOR

LABORERS - ZONE 3 (BUILDING & SITE)

For apprentice rates see "Apprentice - LABORER"

<table>
<thead>
<tr>
<th>Step</th>
<th>06/06/2016</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</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>
</tr>
<tr>
<td>12</td>
<td>05/06/2016</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice - OPERATING ENGINEERS"

### COMPRESSOR OPERATOR

OPERATING ENGINEERS LOCAL 98

<table>
<thead>
<tr>
<th>Step</th>
<th>06/01/2016</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>06/01/2016</td>
<td>$32.85</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.24</td>
</tr>
<tr>
<td>12</td>
<td>01/01/2016</td>
<td>$33.25</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.11</td>
</tr>
<tr>
<td>6</td>
<td>01/01/2016</td>
<td>$33.86</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$56.99</td>
</tr>
<tr>
<td>12</td>
<td>01/01/2016</td>
<td>$34.46</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$57.86</td>
</tr>
<tr>
<td>6</td>
<td>01/01/2016</td>
<td>$35.07</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$58.74</td>
</tr>
<tr>
<td>12</td>
<td>01/01/2016</td>
<td>$35.67</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$59.61</td>
</tr>
<tr>
<td>6</td>
<td>01/01/2016</td>
<td>$36.18</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.39</td>
</tr>
<tr>
<td>12</td>
<td>01/01/2016</td>
<td>$36.78</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.26</td>
</tr>
</tbody>
</table>
## Classification

**CRANE OPERATOR**  
*OPERATING ENGINEERS LOCAL 98*

<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>06/01/2016</td>
<td>$36.88</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$59.27</td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$37.28</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$60.14</td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$37.89</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$61.02</td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$38.49</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$61.89</td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$39.10</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$62.77</td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$39.70</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$63.64</td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$40.21</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$64.42</td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$40.81</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$65.29</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- OPERATING ENGINEERS"  

**DELEADER (BRIDGE)**  
*PAINTERS LOCAL 35 - ZONE 3*

<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>07/01/2016</td>
<td>$50.46</td>
<td>$7.85</td>
<td>$16.10</td>
<td>$0.00</td>
<td>$74.41</td>
</tr>
<tr>
<td>01/01/2017</td>
<td>$51.41</td>
<td>$7.85</td>
<td>$16.10</td>
<td>$0.00</td>
<td>$75.36</td>
</tr>
</tbody>
</table>

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

### Effective Date - 07/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$25.23</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$33.08</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$27.75</td>
<td>$7.85</td>
<td>$3.66</td>
<td>$0.00</td>
<td>$39.26</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$30.28</td>
<td>$7.85</td>
<td>$3.99</td>
<td>$0.00</td>
<td>$42.12</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$32.80</td>
<td>$7.85</td>
<td>$4.32</td>
<td>$0.00</td>
<td>$44.97</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$35.32</td>
<td>$7.85</td>
<td>$14.11</td>
<td>$0.00</td>
<td>$57.28</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$37.85</td>
<td>$7.85</td>
<td>$14.44</td>
<td>$0.00</td>
<td>$60.14</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$40.37</td>
<td>$7.85</td>
<td>$14.77</td>
<td>$0.00</td>
<td>$62.99</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$45.41</td>
<td>$7.85</td>
<td>$15.44</td>
<td>$0.00</td>
<td>$68.70</td>
</tr>
</tbody>
</table>

### Effective Date - 01/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$25.71</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$33.56</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$28.28</td>
<td>$7.85</td>
<td>$3.66</td>
<td>$0.00</td>
<td>$39.79</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$30.85</td>
<td>$7.85</td>
<td>$3.99</td>
<td>$0.00</td>
<td>$42.69</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$33.42</td>
<td>$7.85</td>
<td>$4.32</td>
<td>$0.00</td>
<td>$45.59</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$35.99</td>
<td>$7.85</td>
<td>$14.11</td>
<td>$0.00</td>
<td>$57.95</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$38.56</td>
<td>$7.85</td>
<td>$14.44</td>
<td>$0.00</td>
<td>$60.85</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$41.13</td>
<td>$7.85</td>
<td>$14.77</td>
<td>$0.00</td>
<td>$63.75</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$46.27</td>
<td>$7.85</td>
<td>$15.44</td>
<td>$0.00</td>
<td>$69.56</td>
</tr>
</tbody>
</table>

**Notes:**

- Steps are 750 hrs.

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

**DEMO: ADZEMAN**  
*LABORERS - ZONE 3 (BUILDING & SITE)*

For apprentice rates see "Apprentice- LABORER"

<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>12/01/2015</td>
<td>$35.50</td>
<td>$7.45</td>
<td>$13.55</td>
<td>$0.00</td>
<td>$56.50</td>
</tr>
</tbody>
</table>

**DEMO: BACKHOE/LOADER/HAMMER OPERATOR**  
*LABORERS - ZONE 3 (BUILDING & SITE)*

For apprentice rates see "Apprentice- LABORER"

<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>12/01/2015</td>
<td>$36.50</td>
<td>$7.45</td>
<td>$13.55</td>
<td>$0.00</td>
<td>$57.50</td>
</tr>
</tbody>
</table>

**DEMO: BURNERS**  
*LABORERS - ZONE 3 (BUILDING & SITE)*

<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>12/01/2015</td>
<td>$36.25</td>
<td>$7.45</td>
<td>$13.55</td>
<td>$0.00</td>
<td>$57.25</td>
</tr>
</tbody>
</table>

**Issue Date:** 10/20/2016  
**Wage Request Number:** 20161020-031  
**Page 7 of 34**
<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>DEMO: CONCRETE CUTTER/SAWYER</td>
<td>12/01/2015</td>
<td>$36.50</td>
<td>$7.45</td>
<td>$13.55</td>
<td>$0.00</td>
<td>$57.50</td>
</tr>
<tr>
<td>LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEMO: JACKHAMMER OPERATOR</td>
<td>12/01/2015</td>
<td>$36.25</td>
<td>$7.45</td>
<td>$13.55</td>
<td>$0.00</td>
<td>$57.25</td>
</tr>
<tr>
<td>LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEMO: WRECKING LABORER</td>
<td>12/01/2015</td>
<td>$35.50</td>
<td>$7.45</td>
<td>$13.55</td>
<td>$0.00</td>
<td>$56.50</td>
</tr>
<tr>
<td>LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIVER</td>
<td>08/01/2015</td>
<td>$60.34</td>
<td>$9.80</td>
<td>$18.17</td>
<td>$0.00</td>
<td>$88.31</td>
</tr>
<tr>
<td>PILE DRIVER LOCAL 56 (ZONE 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIVER TENDER</td>
<td>08/01/2015</td>
<td>$43.10</td>
<td>$9.80</td>
<td>$18.17</td>
<td>$0.00</td>
<td>$71.07</td>
</tr>
<tr>
<td>PILE DRIVER LOCAL 56 (ZONE 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIVER TENDER (EFFLUENT)</td>
<td>08/01/2015</td>
<td>$64.65</td>
<td>$9.80</td>
<td>$18.17</td>
<td>$0.00</td>
<td>$92.62</td>
</tr>
<tr>
<td>PILE DRIVER LOCAL 56 (ZONE 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIVER/SLURRY (EFFLUENT)</td>
<td>08/01/2015</td>
<td>$90.51</td>
<td>$9.80</td>
<td>$18.17</td>
<td>$0.00</td>
<td>$118.48</td>
</tr>
<tr>
<td>PILE DRIVER LOCAL 56 (ZONE 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELECTRICIAN (Including Core Drilling)</td>
<td>07/03/2016</td>
<td>$39.11</td>
<td>$9.35</td>
<td>$10.32</td>
<td>$0.00</td>
<td>$58.78</td>
</tr>
<tr>
<td>ELECTRICIANS LOCAL 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>01/01/2017</td>
<td>$40.01</td>
<td>$9.35</td>
<td>$10.32</td>
<td>$0.00</td>
<td>$59.68</td>
</tr>
</tbody>
</table>

**Apprentice - ELECTRICIAN - Local 7**

**Effective Date - 07/03/2016**

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>$15.64</td>
<td>$5.00</td>
<td>$0.47</td>
<td>$0.00</td>
<td>$21.11</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>$17.60</td>
<td>$5.00</td>
<td>$0.53</td>
<td>$0.00</td>
<td>$23.13</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>$19.56</td>
<td>$9.35</td>
<td>$6.04</td>
<td>$0.00</td>
<td>$34.95</td>
</tr>
<tr>
<td>4</td>
<td>55</td>
<td>$21.51</td>
<td>$9.35</td>
<td>$6.10</td>
<td>$0.00</td>
<td>$36.96</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>$25.42</td>
<td>$9.35</td>
<td>$7.21</td>
<td>$0.00</td>
<td>$41.98</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>$27.38</td>
<td>$9.35</td>
<td>$8.27</td>
<td>$0.00</td>
<td>$45.00</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>$16.00</td>
<td>$5.00</td>
<td>$0.48</td>
<td>$0.00</td>
<td>$21.48</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>$18.00</td>
<td>$5.00</td>
<td>$0.54</td>
<td>$0.00</td>
<td>$23.54</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>$20.01</td>
<td>$9.35</td>
<td>$6.05</td>
<td>$0.00</td>
<td>$35.41</td>
</tr>
<tr>
<td>4</td>
<td>55</td>
<td>$22.01</td>
<td>$9.35</td>
<td>$6.11</td>
<td>$0.00</td>
<td>$37.47</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>$26.01</td>
<td>$9.35</td>
<td>$7.23</td>
<td>$0.00</td>
<td>$42.59</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>$28.01</td>
<td>$9.35</td>
<td>$8.29</td>
<td>$0.00</td>
<td>$45.65</td>
</tr>
</tbody>
</table>

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

Apprentice to Journeyworker Ratio: 2:3****
<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEVATOR CONSTRUCTOR</td>
<td>01/01/2016</td>
<td>$48.77</td>
<td>$14.43</td>
<td>$14.96</td>
<td>$0.00</td>
<td>$78.16</td>
</tr>
<tr>
<td>ELEVATOR CONSTRUCTORS LOCAL 41</td>
<td>01/01/2017</td>
<td>$49.90</td>
<td>$15.28</td>
<td>$15.71</td>
<td>$0.00</td>
<td>$80.89</td>
</tr>
</tbody>
</table>

### Apprentice - ELEVATOR CONSTRUCTOR - Local 41

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

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$24.39</td>
<td>$14.43</td>
<td>$14.96</td>
<td>$0.00</td>
<td>$53.78</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$26.82</td>
<td>$14.43</td>
<td>$14.96</td>
<td>$0.00</td>
<td>$56.21</td>
</tr>
<tr>
<td>3</td>
<td>65</td>
<td>$31.70</td>
<td>$14.43</td>
<td>$14.96</td>
<td>$0.00</td>
<td>$61.09</td>
</tr>
<tr>
<td>4</td>
<td>70</td>
<td>$34.14</td>
<td>$14.43</td>
<td>$14.96</td>
<td>$0.00</td>
<td>$63.53</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>$39.02</td>
<td>$14.43</td>
<td>$14.96</td>
<td>$0.00</td>
<td>$68.41</td>
</tr>
</tbody>
</table>

**Effective Date:** 01/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$24.95</td>
<td>$15.28</td>
<td>$15.71</td>
<td>$0.00</td>
<td>$55.94</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$27.45</td>
<td>$15.28</td>
<td>$15.71</td>
<td>$0.00</td>
<td>$58.44</td>
</tr>
<tr>
<td>3</td>
<td>65</td>
<td>$32.44</td>
<td>$15.28</td>
<td>$15.71</td>
<td>$0.00</td>
<td>$63.43</td>
</tr>
<tr>
<td>4</td>
<td>70</td>
<td>$34.93</td>
<td>$15.28</td>
<td>$15.71</td>
<td>$0.00</td>
<td>$65.92</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>$39.92</td>
<td>$15.28</td>
<td>$15.71</td>
<td>$0.00</td>
<td>$70.91</td>
</tr>
</tbody>
</table>

**Notes:**

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

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

---

**ELEVATOR CONSTRUCTOR HELPER**

<table>
<thead>
<tr>
<th></th>
<th>01/01/2016</th>
<th>$34.14</th>
<th>$14.43</th>
<th>$14.96</th>
<th>$0.00</th>
<th>$63.53</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>01/01/2017</td>
<td>$34.93</td>
<td>$15.28</td>
<td>$15.71</td>
<td>$0.00</td>
<td>$65.92</td>
</tr>
</tbody>
</table>

*For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

**FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)**

*LABORERS - ZONE 3 (HEAVY & HIGHWAY)*

<table>
<thead>
<tr>
<th></th>
<th>06/01/2016</th>
<th>$29.25</th>
<th>$7.45</th>
<th>$10.52</th>
<th>$0.00</th>
<th>$47.22</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$30.00</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.97</td>
</tr>
</tbody>
</table>

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

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

*OPERATING ENGINEERS LOCAL 98*

|                     | 06/01/1999 | $18.84 | $4.80  | $4.10   | $0.00        | $27.74     |

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

*OPERATING ENGINEERS LOCAL 98*

|                     | 06/01/1999 | $21.33 | $4.80  | $4.10   | $0.00        | $30.23     |

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

*OPERATING ENGINEERS LOCAL 98*

|                     | 06/01/1999 | $22.33 | $4.80  | $4.10   | $0.00        | $31.23     |

**FIRE ALARM INSTALLER**

*ELECTRICIANS LOCAL 7*

<table>
<thead>
<tr>
<th></th>
<th>07/03/2016</th>
<th>$39.11</th>
<th>$9.35</th>
<th>$10.32</th>
<th>$0.00</th>
<th>$58.78</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>01/01/2017</td>
<td>$40.01</td>
<td>$9.35</td>
<td>$10.32</td>
<td>$0.00</td>
<td>$59.68</td>
</tr>
</tbody>
</table>

*For apprentice rates see "Apprentice- ELECTRICIAN"

**FIRE ALARM REPAIR / MAINTENANCE**

*COMMISSIONING ELECTRICIANS LOCAL 7*

<table>
<thead>
<tr>
<th></th>
<th>07/03/2016</th>
<th>$39.11</th>
<th>$9.35</th>
<th>$10.32</th>
<th>$0.00</th>
<th>$58.78</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>01/01/2017</td>
<td>$40.01</td>
<td>$9.35</td>
<td>$10.32</td>
<td>$0.00</td>
<td>$59.68</td>
</tr>
</tbody>
</table>

*For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"
## Classification

<table>
<thead>
<tr>
<th>FIREMAN</th>
<th>OPERATING ENGINEERS LOCAL 98</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective Date</td>
<td>Base Wage</td>
</tr>
<tr>
<td>06/01/2016</td>
<td>$32.85</td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$33.25</td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$33.86</td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$34.46</td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$35.07</td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$35.67</td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$36.18</td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$36.78</td>
</tr>
</tbody>
</table>

## Apprentice - OPERATING ENGINEERS - Local 98 Class 3

### Effective Date - 06/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>$19.71</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$42.10</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>$23.00</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$45.39</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>$26.28</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$48.67</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
<td>$29.57</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$51.96</td>
</tr>
</tbody>
</table>

### Effective Date - 12/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>$19.95</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$42.81</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>$23.28</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$46.14</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>$26.60</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$49.46</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
<td>$29.93</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$52.79</td>
</tr>
</tbody>
</table>

### Notes:
Steps 1-2 are 1000 hrs.; Steps 3-4 are 2000 hrs.
Apprentice to Journeyworker Ratio: 1:6

## FLAPPER & SIGNALER (HEAVY & HIGHWAY)

<table>
<thead>
<tr>
<th>LABORERS - ZONE 3 (HEAVY &amp; HIGHWAY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/01/2016</td>
</tr>
<tr>
<td>12/01/2016</td>
</tr>
</tbody>
</table>

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

## FLOORCOVERER

<table>
<thead>
<tr>
<th>ZONE 3</th>
<th>FLOORCOVERERS LOCAL 2168 ZONE III</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/01/2016</td>
<td>$32.60</td>
</tr>
</tbody>
</table>
### Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Apprentice - FLOORCOVERER - Local 2168 Zone III</strong></td>
<td><strong>03/01/2016</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>percent</td>
<td>Apprentice Base Wage</td>
<td>Health</td>
<td>Pension</td>
<td>Supplemental</td>
<td>Unemployment</td>
<td>Total Rate</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
<td>$16.30</td>
<td>$8.55</td>
<td>$1.20</td>
<td>$0.00</td>
<td>$26.05</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$17.93</td>
<td>$8.55</td>
<td>$1.20</td>
<td>$0.00</td>
<td>$27.68</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$19.56</td>
<td>$8.55</td>
<td>$10.82</td>
<td>$0.00</td>
<td>$38.93</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$21.19</td>
<td>$8.55</td>
<td>$10.82</td>
<td>$0.00</td>
<td>$40.56</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$22.82</td>
<td>$8.55</td>
<td>$12.02</td>
<td>$0.00</td>
<td>$43.39</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$24.45</td>
<td>$8.55</td>
<td>$12.02</td>
<td>$0.00</td>
<td>$45.02</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$26.08</td>
<td>$8.55</td>
<td>$13.22</td>
<td>$0.00</td>
<td>$47.85</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>85</td>
<td>$27.71</td>
<td>$8.55</td>
<td>$13.22</td>
<td>$0.00</td>
<td>$49.48</td>
<td></td>
</tr>
</tbody>
</table>

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

**Fork Lift**

<table>
<thead>
<tr>
<th>Operating Engineers Local 98</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>
<td>$33.07</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.46</td>
<td></td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$33.47</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.33</td>
<td></td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$34.08</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$57.21</td>
<td></td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$34.68</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$58.08</td>
<td></td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$35.29</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$58.96</td>
<td></td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$35.89</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$59.83</td>
<td></td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$36.40</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.61</td>
<td></td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$37.00</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.48</td>
<td></td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice - Operating Engineers"

**Generators/Lighting Plants**

<table>
<thead>
<tr>
<th>Operating Engineers Local 98</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>
<td>$29.62</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$52.01</td>
<td></td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$30.02</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$52.88</td>
<td></td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$30.63</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$53.76</td>
<td></td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$31.23</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$54.63</td>
<td></td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$31.84</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$55.51</td>
<td></td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$32.44</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$56.38</td>
<td></td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$32.95</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$57.16</td>
<td></td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$33.55</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$58.03</td>
<td></td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice - Operating Engineers"

**Glazier (Glass Plank/Air Barrier/Interior Systems)**

<table>
<thead>
<tr>
<th>Glaziers Local 1333</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>
<td>$35.58</td>
<td>$10.70</td>
<td>$8.25</td>
<td>$0.00</td>
<td>$54.53</td>
<td></td>
</tr>
</tbody>
</table>

Issue Date: 10/20/2016  Wage Request Number: 20161020-031
### Classification: GLAZIER - Local 1333
### Effective Date: 06/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$17.79</td>
<td>$10.70</td>
<td>$1.00</td>
<td>$0.00</td>
<td>$29.49</td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>$20.01</td>
<td>$10.70</td>
<td>$1.00</td>
<td>$0.00</td>
<td>$31.71</td>
</tr>
<tr>
<td>3</td>
<td>63</td>
<td>$22.24</td>
<td>$10.70</td>
<td>$1.50</td>
<td>$0.00</td>
<td>$34.44</td>
</tr>
<tr>
<td>4</td>
<td>69</td>
<td>$24.46</td>
<td>$10.70</td>
<td>$1.50</td>
<td>$0.00</td>
<td>$36.66</td>
</tr>
<tr>
<td>5</td>
<td>75</td>
<td>$26.69</td>
<td>$10.70</td>
<td>$2.00</td>
<td>$0.00</td>
<td>$39.39</td>
</tr>
<tr>
<td>6</td>
<td>81</td>
<td>$28.91</td>
<td>$10.70</td>
<td>$2.00</td>
<td>$0.00</td>
<td>$41.61</td>
</tr>
<tr>
<td>7</td>
<td>88</td>
<td>$31.13</td>
<td>$10.70</td>
<td>$8.00</td>
<td>$0.00</td>
<td>$49.83</td>
</tr>
<tr>
<td>8</td>
<td>94</td>
<td>$33.36</td>
<td>$10.70</td>
<td>$8.00</td>
<td>$0.00</td>
<td>$52.06</td>
</tr>
</tbody>
</table>

#### Notes:

Apprentice to Journeyworker Ratio: 1:3

---

### Notes:

Apprentice to Journeyworker Ratio: 1:3

---

### GRADER/TRENCHING MACHINE/DERRICK
OPERATING ENGINEERS LOCAL 98

<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>06/01/2016</td>
<td>$33.38</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.77</td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$33.78</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.64</td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$34.39</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$57.52</td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$34.99</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$58.39</td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$35.60</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$59.27</td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$36.20</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$60.14</td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$36.71</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.92</td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$37.31</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.79</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

---

### HVAC (DUCTWORK)
SHEETMETAL WORKERS LOCAL 63

<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>07/01/2016</td>
<td>$32.28</td>
<td>$10.54</td>
<td>$14.90</td>
<td>$1.70</td>
<td>$59.42</td>
</tr>
<tr>
<td>01/01/2017</td>
<td>$33.03</td>
<td>$10.54</td>
<td>$14.90</td>
<td>$1.70</td>
<td>$60.17</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- SHEET METAL WORKER"

---

### HVAC (ELECTRICAL CONTROLS)
ELECTRICIANS LOCAL 7

<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>07/03/2016</td>
<td>$39.11</td>
<td>$9.35</td>
<td>$10.32</td>
<td>$0.00</td>
<td>$58.78</td>
</tr>
<tr>
<td>01/01/2017</td>
<td>$40.01</td>
<td>$9.35</td>
<td>$10.32</td>
<td>$0.00</td>
<td>$59.68</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- ELECTRICIAN"

---

### HVAC (TESTING AND BALANCING - AIR)
SHEETMETAL WORKERS LOCAL 63

<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>07/01/2016</td>
<td>$32.28</td>
<td>$10.54</td>
<td>$14.90</td>
<td>$1.70</td>
<td>$59.42</td>
</tr>
<tr>
<td>01/01/2017</td>
<td>$33.03</td>
<td>$10.54</td>
<td>$14.90</td>
<td>$1.70</td>
<td>$60.17</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- SHEET METAL WORKER"

---

### HVAC (TESTING AND BALANCING - WATER)
PLUMBERS & PIPEFITTERS LOCAL 104

<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>03/17/2016</td>
<td>$38.26</td>
<td>$8.45</td>
<td>$15.05</td>
<td>$0.00</td>
<td>$61.76</td>
</tr>
</tbody>
</table>

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

---

### HVAC MECHANIC
PLUMBERS & PIPEFITTERS LOCAL 104

<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>03/17/2016</td>
<td>$38.26</td>
<td>$8.45</td>
<td>$15.05</td>
<td>$0.00</td>
<td>$61.76</td>
</tr>
</tbody>
</table>

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

---

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

<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>06/01/2016</td>
<td>$29.75</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.72</td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$30.50</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$48.47</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"
### Classification:  Heat & Frost Insulators Local 6 (Springfield)

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/01/2016</td>
<td>$36.07</td>
<td>$11.75</td>
<td>$14.20</td>
<td>$62.02</td>
</tr>
<tr>
<td>09/01/2017</td>
<td>$37.67</td>
<td>$11.75</td>
<td>$14.20</td>
<td>$63.62</td>
</tr>
<tr>
<td>09/01/2018</td>
<td>$39.47</td>
<td>$11.75</td>
<td>$14.20</td>
<td>$65.42</td>
</tr>
<tr>
<td>09/01/2019</td>
<td>$41.47</td>
<td>$11.75</td>
<td>$14.20</td>
<td>$67.42</td>
</tr>
</tbody>
</table>

### Apprentice - Asbestos Insulator (Pipes & Tanks) - Local 6 Springfield

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/01/2016</td>
<td>$18.04</td>
<td>$11.75</td>
<td>$10.45</td>
<td>$40.24</td>
</tr>
</tbody>
</table>

### Effective Date - 09/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$18.04</td>
<td>$11.75</td>
<td>$10.45</td>
<td>$40.24</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>$21.64</td>
<td>$11.75</td>
<td>$11.20</td>
<td>$44.59</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$25.25</td>
<td>$11.75</td>
<td>$11.95</td>
<td>$48.95</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$28.86</td>
<td>$11.75</td>
<td>$12.70</td>
<td>$53.31</td>
</tr>
</tbody>
</table>

### Effective Date - 09/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$18.84</td>
<td>$11.75</td>
<td>$10.45</td>
<td>$41.04</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>$22.60</td>
<td>$11.75</td>
<td>$11.20</td>
<td>$45.55</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$26.37</td>
<td>$11.75</td>
<td>$11.95</td>
<td>$50.07</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$30.14</td>
<td>$11.75</td>
<td>$12.70</td>
<td>$54.59</td>
</tr>
</tbody>
</table>

**Notes:**
- Steps are 1 year
- Apprentice to Journeyworker Ratio: 1:4

### Ironworker/Welder

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/16/2016</td>
<td>$31.74</td>
<td>$7.80</td>
<td>$19.60</td>
<td>$59.14</td>
</tr>
<tr>
<td>03/16/2017</td>
<td>$32.39</td>
<td>$7.80</td>
<td>$19.60</td>
<td>$59.79</td>
</tr>
<tr>
<td>Step</td>
<td>percent</td>
<td>Apprentice Base Wage</td>
<td>Health</td>
<td>Pension</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------------------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>60</td>
<td>$19.04</td>
<td>$7.80</td>
<td>$19.60</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>$22.22</td>
<td>$7.80</td>
<td>$19.60</td>
</tr>
<tr>
<td>3</td>
<td>75</td>
<td>$23.81</td>
<td>$7.80</td>
<td>$19.60</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$25.39</td>
<td>$7.80</td>
<td>$19.60</td>
</tr>
<tr>
<td>5</td>
<td>85</td>
<td>$26.98</td>
<td>$7.80</td>
<td>$19.60</td>
</tr>
<tr>
<td>6</td>
<td>90</td>
<td>$28.57</td>
<td>$7.80</td>
<td>$19.60</td>
</tr>
</tbody>
</table>

**Effective Date - 09/16/2016**

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>$19.43</td>
<td>$7.80</td>
<td>$19.60</td>
<td>$0.00</td>
<td>$46.83</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>$22.67</td>
<td>$7.80</td>
<td>$19.60</td>
<td>$0.00</td>
<td>$50.07</td>
</tr>
<tr>
<td>3</td>
<td>75</td>
<td>$24.29</td>
<td>$7.80</td>
<td>$19.60</td>
<td>$0.00</td>
<td>$51.69</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$25.91</td>
<td>$7.80</td>
<td>$19.60</td>
<td>$0.00</td>
<td>$53.31</td>
</tr>
<tr>
<td>5</td>
<td>85</td>
<td>$27.53</td>
<td>$7.80</td>
<td>$19.60</td>
<td>$0.00</td>
<td>$54.93</td>
</tr>
<tr>
<td>6</td>
<td>90</td>
<td>$29.15</td>
<td>$7.80</td>
<td>$19.60</td>
<td>$0.00</td>
<td>$56.55</td>
</tr>
</tbody>
</table>

**Effective Date - 03/16/2017**

Notes: Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

<table>
<thead>
<tr>
<th>Jackhammer &amp; Paving Breaker Operator</th>
<th>06/06/2016</th>
<th>$29.40</th>
<th>$7.45</th>
<th>$12.40</th>
<th>$0.00</th>
<th>$49.25</th>
</tr>
</thead>
<tbody>
<tr>
<td>LABORER LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td>12/05/2016</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS - ZONE 3 (BUILDING & SITE)

<table>
<thead>
<tr>
<th>06/06/2016</th>
<th>$29.15</th>
<th>$7.45</th>
<th>$12.40</th>
<th>$0.00</th>
<th>$49.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/05/2016</td>
<td>$29.83</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.68</td>
</tr>
</tbody>
</table>
### Apprentice - LABORER - Zone 3 Building & Site

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

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>$17.49</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$37.34</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>$20.41</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$40.26</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>$23.32</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$43.17</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
<td>$26.24</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$46.09</td>
</tr>
</tbody>
</table>

**Effective Date**: 12/05/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>$17.90</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$37.75</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>$20.88</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$40.73</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>$23.86</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$43.71</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
<td>$26.85</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$46.70</td>
</tr>
</tbody>
</table>

**Notes:**
- Apprentice to Journeyworker Ratio: 1:5

### Apprentice - LABORER (HEAVY & HIGHWAY)

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

<table>
<thead>
<tr>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$29.00</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$46.97</td>
</tr>
</tbody>
</table>

**Effective Date**: 12/01/2016

<table>
<thead>
<tr>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$29.75</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.72</td>
</tr>
</tbody>
</table>

**Notes:**
- Apprentice to Journeyworker Ratio: 1:5

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

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

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>$17.40</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$35.37</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>$20.30</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$38.27</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>$23.20</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$41.17</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
<td>$26.10</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$44.07</td>
</tr>
</tbody>
</table>

**Effective Date**: 12/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>$17.85</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$35.82</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>$20.83</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$38.80</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>$23.80</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$41.77</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
<td>$26.78</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$44.75</td>
</tr>
</tbody>
</table>

**Notes:**
- Apprentice to Journeyworker Ratio: 1:5

### LABORER: CARPENTER TENDER

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

<table>
<thead>
<tr>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$29.15</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.00</td>
</tr>
</tbody>
</table>

**Effective Date**: 12/05/2016

<table>
<thead>
<tr>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$29.83</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.68</td>
</tr>
</tbody>
</table>

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>LABORER: CEMENT FINISHER TENDER</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>
</tr>
<tr>
<td>LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
<td>12/05/2016</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- LABORER"

| LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER  | 12/07/2015     | $29.10    | $7.45  | $11.86  | $0.00                     | $48.41     |
| LABORERS - ZONE 3 (BUILDING & SITE)       |                |           |        |         |                           |            |

For apprentice rates see "Apprentice- LABORER"

| LABORER: MASON TENDER                     | 06/06/2016     | $30.15    | $7.45  | $12.40  | $0.00                     | $50.00     |
| LABORERS - ZONE 3 (BUILDING & SITE)       | 12/05/2016     | $30.83    | $7.45  | $12.40  | $0.00                     | $50.68     |

For apprentice rates see "Apprentice- LABORER"

| LABORER: MASON TENDER (HEAVY & HIGHWAY)   | 06/01/2016     | $29.25    | $7.45  | $10.52  | $0.00                     | $47.22     |
| LABORERS - ZONE 3 (HEAVY & HIGHWAY)       | 12/01/2016     | $30.00    | $7.45  | $10.52  | $0.00                     | $47.97     |

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

| LABORER: MULTI-TRADE TENDER               | 06/06/2016     | $29.15    | $7.45  | $12.40  | $0.00                     | $49.00     |
| LABORERS - ZONE 3 (BUILDING & SITE)       | 12/05/2016     | $29.83    | $7.45  | $12.40  | $0.00                     | $49.68     |

For apprentice rates see "Apprentice- LABORER"

| LABORER: TREE REMOVER                     | 06/06/2016     | $29.15    | $7.45  | $12.40  | $0.00                     | $49.00     |
| LABORERS - ZONE 3 (BUILDING & SITE)       | 12/05/2016     | $29.83    | $7.45  | $12.40  | $0.00                     | $49.68     |

This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER"

| LASER BEAM OPERATOR                       | 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"

| LASER BEAM OPERATOR (HEAVY & HIGHWAY)     | 06/01/2016     | $29.25    | $7.45  | $10.52  | $0.00                     | $47.22     |
| LABORERS - ZONE 3 (HEAVY & HIGHWAY)       | 12/01/2016     | $30.00    | $7.45  | $10.52  | $0.00                     | $47.97     |

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

| MARBLE & TILE FINISHERS                   | 09/05/2016     | $32.67    | $10.18 | $17.05  | $0.00                     | $59.90     |
| BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE | 02/27/2017  | $33.24    | $10.18 | $17.05  | $0.00                     | $60.47     |
### Apprentices - MARBLE-TILE-TERRAZZO FINISHER - Local 3 Marble/Tile (Spr/Pitt)

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

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$16.34</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$43.57</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>$19.60</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$46.83</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$22.87</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$50.10</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$26.14</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$53.37</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
<td>$29.40</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$56.63</td>
</tr>
</tbody>
</table>

**Effective Date:** 02/27/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$16.62</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$43.85</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>$19.94</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$47.17</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$23.27</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$50.50</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$26.59</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$53.82</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
<td>$29.92</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$57.15</td>
</tr>
</tbody>
</table>

**Notes:**
- Apprentice to Journeyworker Ratio: 1:5

---

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

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

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$39.26</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$66.82</td>
</tr>
</tbody>
</table>

**Effective Date:** 02/27/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$39.83</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$67.39</td>
</tr>
</tbody>
</table>

**Notes:**
- Apprentice to Journeyworker Ratio: 1:5

---

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

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

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$19.63</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$47.19</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>$23.56</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$51.12</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$27.48</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$55.04</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$31.41</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$58.97</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
<td>$35.33</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$62.89</td>
</tr>
</tbody>
</table>

**Effective Date:** 02/27/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$19.92</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$47.48</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>$23.90</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$51.46</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$27.88</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$55.44</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$31.86</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$59.42</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
<td>$35.85</td>
<td>$10.18</td>
<td>$17.38</td>
<td>$0.00</td>
<td>$63.41</td>
</tr>
</tbody>
</table>

**Notes:**
- Apprentice to Journeyworker Ratio: 1:5
## Classification

### MECH. SWEEPER OPERATOR (ON CONST. SITES)
*OPERATING ENGINEERS LOCAL 98*

<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>06/01/2016</td>
<td>$33.38</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.77</td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$33.78</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.64</td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$34.39</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$57.52</td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$34.99</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$58.39</td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$35.60</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$59.27</td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$36.20</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$60.14</td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$36.71</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.92</td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$37.31</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.79</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

### MECHANIC/WELDER/BOOM TRUCK
*OPERATING ENGINEERS LOCAL 98*

<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>06/01/2016</td>
<td>$32.85</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.24</td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$33.25</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.11</td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$33.86</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$56.99</td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$34.46</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$57.86</td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$35.07</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$58.74</td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$35.67</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$59.61</td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$36.18</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.39</td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$36.78</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.26</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

### MILLWRIGHT (Zone 3)
*MILLWRIGHTS LOCAL 1121 - Zone 3*

<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>04/01/2015</td>
<td>$33.13</td>
<td>$9.80</td>
<td>$16.21</td>
<td>$0.00</td>
<td>$59.14</td>
</tr>
</tbody>
</table>

### Apprentice - MILLWRIGHT - Local 1121 Zone 3

<table>
<thead>
<tr>
<th>Effective Date -</th>
<th>04/01/2015</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>55</td>
<td>$18.22</td>
<td>$9.80</td>
<td>$4.48</td>
<td>$0.00</td>
<td>$32.50</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>$21.53</td>
<td>$9.80</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$44.69</td>
</tr>
<tr>
<td>3</td>
<td>75</td>
<td>$24.85</td>
<td>$9.80</td>
<td>$14.18</td>
<td>$0.00</td>
<td>$48.83</td>
</tr>
<tr>
<td>4</td>
<td>85</td>
<td>$28.16</td>
<td>$9.80</td>
<td>$14.99</td>
<td>$0.00</td>
<td>$52.95</td>
</tr>
</tbody>
</table>

Notes:

- Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

### MORTAR MIXER
*LABORERS - ZONE 3 (BUILDING & SITE)*

<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>06/06/2016</td>
<td>$29.40</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.25</td>
</tr>
<tr>
<td>12/05/2016</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- LABORER"

### OILER
*OPERATING ENGINEERS LOCAL 98*

<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>06/01/2016</td>
<td>$28.54</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$50.93</td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$28.94</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$51.80</td>
</tr>
<tr>
<td>06/01/2017</td>
<td>$29.55</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$52.68</td>
</tr>
<tr>
<td>12/01/2017</td>
<td>$30.15</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$53.55</td>
</tr>
<tr>
<td>06/01/2018</td>
<td>$30.76</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$54.43</td>
</tr>
<tr>
<td>12/01/2018</td>
<td>$31.36</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$55.30</td>
</tr>
<tr>
<td>06/01/2019</td>
<td>$31.87</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$56.08</td>
</tr>
<tr>
<td>12/01/2019</td>
<td>$32.47</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$56.95</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- OPERATING ENGINEERS"
<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTHER POWER DRIVEN EQUIPMENT - CLASS VI</td>
<td>06/01/2016</td>
<td>$26.56</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$48.95</td>
</tr>
<tr>
<td>OPERATING ENGINEERS LOCAL 98</td>
<td>12/01/2016</td>
<td>$26.96</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$49.82</td>
</tr>
<tr>
<td></td>
<td>06/01/2017</td>
<td>$27.57</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$50.70</td>
</tr>
<tr>
<td></td>
<td>12/01/2017</td>
<td>$28.17</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$51.57</td>
</tr>
<tr>
<td></td>
<td>06/01/2018</td>
<td>$28.78</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$52.45</td>
</tr>
<tr>
<td></td>
<td>12/01/2018</td>
<td>$29.38</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$53.32</td>
</tr>
<tr>
<td></td>
<td>06/01/2019</td>
<td>$29.89</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$54.10</td>
</tr>
<tr>
<td></td>
<td>12/01/2019</td>
<td>$30.49</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$54.97</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

| PAINTER (BRIDGES/TANKS)                              | 07/01/2016     | $50.46    | $7.85  | $16.10  | $0.00        | $64.41     |
|                                                     | 01/01/2017     | $51.41    | $7.85  | $16.10  | $0.00        | $65.36     |

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

**Effective Date - 07/01/2016**

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$25.23</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$33.08</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$27.75</td>
<td>$7.85</td>
<td>$3.66</td>
<td>$0.00</td>
<td>$39.26</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$30.28</td>
<td>$7.85</td>
<td>$3.99</td>
<td>$0.00</td>
<td>$42.12</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$32.80</td>
<td>$7.85</td>
<td>$4.32</td>
<td>$0.00</td>
<td>$44.97</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$35.32</td>
<td>$7.85</td>
<td>$14.11</td>
<td>$0.00</td>
<td>$61.76</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$37.65</td>
<td>$7.85</td>
<td>$14.44</td>
<td>$0.00</td>
<td>$62.49</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$40.37</td>
<td>$7.85</td>
<td>$14.77</td>
<td>$0.00</td>
<td>$65.22</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$45.41</td>
<td>$7.85</td>
<td>$15.44</td>
<td>$0.00</td>
<td>$68.70</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$25.71</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$33.56</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$28.28</td>
<td>$7.85</td>
<td>$3.66</td>
<td>$0.00</td>
<td>$39.79</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$30.85</td>
<td>$7.85</td>
<td>$3.99</td>
<td>$0.00</td>
<td>$42.69</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$33.42</td>
<td>$7.85</td>
<td>$4.32</td>
<td>$0.00</td>
<td>$45.59</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$35.99</td>
<td>$7.85</td>
<td>$14.11</td>
<td>$0.00</td>
<td>$62.83</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$38.56</td>
<td>$7.85</td>
<td>$14.44</td>
<td>$0.00</td>
<td>$64.99</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$41.13</td>
<td>$7.85</td>
<td>$14.77</td>
<td>$0.00</td>
<td>$66.75</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$46.27</td>
<td>$7.85</td>
<td>$15.44</td>
<td>$0.00</td>
<td>$69.66</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/01/2016</td>
<td>$33.78</td>
<td>$7.85</td>
<td>$12.30</td>
<td>$0.00</td>
<td>$53.93</td>
</tr>
<tr>
<td>01/01/2017</td>
<td>$34.68</td>
<td>$7.85</td>
<td>$12.30</td>
<td>$0.00</td>
<td>$54.83</td>
</tr>
<tr>
<td>Step</td>
<td>percent</td>
<td>Apprentice Base Wage</td>
<td>Health</td>
<td>Pension</td>
<td>Supplemental</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>----------------------</td>
<td>--------</td>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
<td>$16.89</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$18.58</td>
<td>$7.85</td>
<td>$1.57</td>
<td>$0.00</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$20.27</td>
<td>$7.85</td>
<td>$1.71</td>
<td>$0.00</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$21.96</td>
<td>$7.85</td>
<td>$1.85</td>
<td>$0.00</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$23.65</td>
<td>$7.85</td>
<td>$11.45</td>
<td>$0.00</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$25.34</td>
<td>$7.85</td>
<td>$11.59</td>
<td>$0.00</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$27.02</td>
<td>$7.85</td>
<td>$11.73</td>
<td>$0.00</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$30.40</td>
<td>$7.85</td>
<td>$12.02</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$17.34</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$25.19</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$19.07</td>
<td>$7.85</td>
<td>$1.57</td>
<td>$0.00</td>
<td>$28.49</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$20.81</td>
<td>$7.85</td>
<td>$1.71</td>
<td>$0.00</td>
<td>$30.37</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$22.54</td>
<td>$7.85</td>
<td>$1.85</td>
<td>$0.00</td>
<td>$32.24</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$24.28</td>
<td>$7.85</td>
<td>$11.45</td>
<td>$0.00</td>
<td>$43.58</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$26.01</td>
<td>$7.85</td>
<td>$11.59</td>
<td>$0.00</td>
<td>$45.45</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$27.74</td>
<td>$7.85</td>
<td>$11.73</td>
<td>$0.00</td>
<td>$47.32</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$31.21</td>
<td>$7.85</td>
<td>$12.02</td>
<td>$0.00</td>
<td>$51.08</td>
</tr>
</tbody>
</table>

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

PAINTER (SPRAY OR SANDBLAST, REPAINT)

<table>
<thead>
<tr>
<th>Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/01/2016</td>
<td>$31.11</td>
<td>$7.85</td>
<td>$12.30</td>
<td>$0.00</td>
<td>$51.26</td>
</tr>
<tr>
<td>01/01/2017</td>
<td>$32.00</td>
<td>$7.85</td>
<td>$12.30</td>
<td>$0.00</td>
<td>$52.15</td>
</tr>
</tbody>
</table>

Issue Date: 10/20/2016  Wage Request Number: 20161020-031
### Apprentice - **PAINTER Local 35 Zone 3 - Spray/Sandblast - Repaint**

**Effective Date:** 07/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$15.56</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$23.41</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$17.11</td>
<td>$7.85</td>
<td>$1.57</td>
<td>$0.00</td>
<td>$26.53</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$18.67</td>
<td>$7.85</td>
<td>$1.71</td>
<td>$0.00</td>
<td>$28.23</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$20.22</td>
<td>$7.85</td>
<td>$1.85</td>
<td>$0.00</td>
<td>$29.92</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$21.78</td>
<td>$7.85</td>
<td>$11.45</td>
<td>$0.00</td>
<td>$41.08</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$23.33</td>
<td>$7.85</td>
<td>$11.59</td>
<td>$0.00</td>
<td>$42.77</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$24.89</td>
<td>$7.85</td>
<td>$11.73</td>
<td>$0.00</td>
<td>$44.47</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$28.00</td>
<td>$7.85</td>
<td>$12.02</td>
<td>$0.00</td>
<td>$47.87</td>
</tr>
</tbody>
</table>

**Effective Date:** 01/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$16.00</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$23.85</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$17.60</td>
<td>$7.85</td>
<td>$1.57</td>
<td>$0.00</td>
<td>$27.02</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$19.20</td>
<td>$7.85</td>
<td>$1.71</td>
<td>$0.00</td>
<td>$28.76</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$20.80</td>
<td>$7.85</td>
<td>$1.85</td>
<td>$0.00</td>
<td>$30.50</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$22.40</td>
<td>$7.85</td>
<td>$11.45</td>
<td>$0.00</td>
<td>$41.70</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$24.00</td>
<td>$7.85</td>
<td>$11.59</td>
<td>$0.00</td>
<td>$43.44</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$25.60</td>
<td>$7.85</td>
<td>$11.73</td>
<td>$0.00</td>
<td>$45.18</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$28.80</td>
<td>$7.85</td>
<td>$12.02</td>
<td>$0.00</td>
<td>$48.67</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Issue Date:</th>
<th>Wage Request Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/20/2016</td>
<td>20161020-031</td>
</tr>
</tbody>
</table>
### Apprentice - PAINTER - Local 35 Zone 3 - BRUSH NEW

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

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$16.19</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$24.04</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$17.81</td>
<td>$7.85</td>
<td>$1.57</td>
<td>$0.00</td>
<td>$27.23</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$19.43</td>
<td>$7.85</td>
<td>$1.71</td>
<td>$0.00</td>
<td>$28.99</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$21.05</td>
<td>$7.85</td>
<td>$1.85</td>
<td>$0.00</td>
<td>$30.75</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$22.67</td>
<td>$7.85</td>
<td>$11.45</td>
<td>$0.00</td>
<td>$41.97</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$24.29</td>
<td>$7.85</td>
<td>$11.59</td>
<td>$0.00</td>
<td>$43.33</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$25.90</td>
<td>$7.85</td>
<td>$11.73</td>
<td>$0.00</td>
<td>$45.48</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$29.14</td>
<td>$7.85</td>
<td>$12.02</td>
<td>$0.00</td>
<td>$49.01</td>
</tr>
</tbody>
</table>

#### Effective Date - 01/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$16.64</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$24.49</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$18.30</td>
<td>$7.85</td>
<td>$1.57</td>
<td>$0.00</td>
<td>$27.72</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$19.97</td>
<td>$7.85</td>
<td>$1.71</td>
<td>$0.00</td>
<td>$29.53</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$21.63</td>
<td>$7.85</td>
<td>$1.85</td>
<td>$0.00</td>
<td>$31.33</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$23.30</td>
<td>$7.85</td>
<td>$11.45</td>
<td>$0.00</td>
<td>$42.60</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$24.96</td>
<td>$7.85</td>
<td>$11.59</td>
<td>$0.00</td>
<td>$44.40</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$26.62</td>
<td>$7.85</td>
<td>$11.73</td>
<td>$0.00</td>
<td>$46.20</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$29.95</td>
<td>$7.85</td>
<td>$12.02</td>
<td>$0.00</td>
<td>$49.82</td>
</tr>
</tbody>
</table>

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

### PAINTER / TAPER (BRUSH, REPAINT)

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PAINTER / TAPER (BRUSH, REPAINT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07/01/2016</td>
<td>$29.70</td>
<td>$7.85</td>
<td>$12.30</td>
<td>$0.00</td>
<td>$49.85</td>
</tr>
<tr>
<td>01/01/2017</td>
<td>$30.60</td>
<td>$7.85</td>
<td>$12.30</td>
<td>$0.00</td>
<td>$50.75</td>
</tr>
</tbody>
</table>
## PAINTER Local 35 Zone 3 - BRUSH REPAINT

### Effective Date - 07/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$14.85</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$22.70</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$16.34</td>
<td>$7.85</td>
<td>$1.57</td>
<td>$0.00</td>
<td>$25.76</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$17.82</td>
<td>$7.85</td>
<td>$1.71</td>
<td>$0.00</td>
<td>$27.38</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$19.31</td>
<td>$7.85</td>
<td>$1.85</td>
<td>$0.00</td>
<td>$29.01</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$20.79</td>
<td>$7.85</td>
<td>$11.45</td>
<td>$0.00</td>
<td>$40.09</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$22.28</td>
<td>$7.85</td>
<td>$11.59</td>
<td>$0.00</td>
<td>$41.72</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$23.76</td>
<td>$7.85</td>
<td>$11.73</td>
<td>$0.00</td>
<td>$43.34</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$26.73</td>
<td>$7.85</td>
<td>$12.02</td>
<td>$0.00</td>
<td>$46.60</td>
</tr>
</tbody>
</table>

### Effective Date - 01/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$15.30</td>
<td>$7.85</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$23.15</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$16.83</td>
<td>$7.85</td>
<td>$1.57</td>
<td>$0.00</td>
<td>$26.25</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$18.36</td>
<td>$7.85</td>
<td>$1.71</td>
<td>$0.00</td>
<td>$27.92</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$19.89</td>
<td>$7.85</td>
<td>$1.85</td>
<td>$0.00</td>
<td>$29.59</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$21.42</td>
<td>$7.85</td>
<td>$11.45</td>
<td>$0.00</td>
<td>$40.72</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$22.95</td>
<td>$7.85</td>
<td>$11.59</td>
<td>$0.00</td>
<td>$42.39</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$24.48</td>
<td>$7.85</td>
<td>$11.73</td>
<td>$0.00</td>
<td>$44.06</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>$27.54</td>
<td>$7.85</td>
<td>$12.02</td>
<td>$0.00</td>
<td>$47.41</td>
</tr>
</tbody>
</table>

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

---

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

<table>
<thead>
<tr>
<th>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>
<td>$29.00</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$46.97</td>
</tr>
<tr>
<td>12/01/2016</td>
<td>$29.75</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.72</td>
</tr>
</tbody>
</table>

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

**TEAMSTERS JOINT COUNCIL NO. 10 ZONE B**

**For apprentice rates see "Apprentice- PILE DRIVER"**

**PIECE AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)**

<table>
<thead>
<tr>
<th>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>08/31/2015</td>
<td>$39.00</td>
<td>$9.80</td>
<td>$18.17</td>
<td>$0.00</td>
<td>$66.97</td>
</tr>
</tbody>
</table>

**PILE DRIVER LOCAL 56 (ZONE 3)**

**For apprentice rates see "Apprentice- PILE DRIVER"**

---

**Issue Date:** 10/20/2016  **Wage Request Number:** 20161020-031  **Page 23 of 34**
### Apprentice - PILE DRIVER - Local 56 Zone 3

<table>
<thead>
<tr>
<th>Effective Date - 08/31/2015</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

**Notes:** Apprentice wages shall be no less than the following Steps;
(Same as set in Zone 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

---

### PIPLAYER

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

<table>
<thead>
<tr>
<th>Effective Date - 06/06/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$29.40</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.25</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Effective Date - 12/05/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
</tbody>
</table>

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

---

### PLUMBER & PIPEFITTER

#### PLUMBERS & PIPEFITERS LOCAL 104

<table>
<thead>
<tr>
<th>Effective Date - 03/17/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>$17.22</td>
<td>$8.45</td>
<td>$9.05</td>
<td>$0.00</td>
<td>$34.72</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>$19.13</td>
<td>$8.45</td>
<td>$9.05</td>
<td>$0.00</td>
<td>$36.63</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$22.96</td>
<td>$8.45</td>
<td>$9.05</td>
<td>$0.00</td>
<td>$40.46</td>
</tr>
<tr>
<td>4</td>
<td>70</td>
<td>$26.78</td>
<td>$8.45</td>
<td>$9.05</td>
<td>$0.00</td>
<td>$44.28</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>$30.61</td>
<td>$8.45</td>
<td>$15.05</td>
<td>$0.00</td>
<td>$54.11</td>
</tr>
</tbody>
</table>

**Notes:** Steps are 2000 hrs.

Apprentice to Journeyworker Ratio: 1:5

---

### PNEUMATIC CONTROLS (TEMP.)

#### PLUMBERS & PIPEFITERS LOCAL 104

<table>
<thead>
<tr>
<th>Effective Date - 03/17/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>$38.26</td>
<td>$8.45</td>
<td>$15.05</td>
<td>$0.00</td>
<td>$61.76</td>
</tr>
</tbody>
</table>

**Notes:** For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

---

### PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY)

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

<table>
<thead>
<tr>
<th>Effective Date - 06/01/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$29.25</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.22</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Effective Date - 12/01/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$30.00</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.97</td>
</tr>
</tbody>
</table>

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

---

### POWDERMAN & BLASTER

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

<table>
<thead>
<tr>
<th>Effective Date - 06/06/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$30.15</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$50.00</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Effective Date - 12/05/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$30.83</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$50.68</td>
</tr>
</tbody>
</table>

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

---

### POWDERMAN & BLASTER (HEAVY & HIGHWAY)

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

<table>
<thead>
<tr>
<th>Effective Date - 06/01/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$30.00</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.97</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Effective Date - 12/01/2016</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>$30.75</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$48.72</td>
</tr>
</tbody>
</table>

**Notes:** For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"
### Classification

<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>PUMP OPERATOR (CONCRETE)</td>
<td>06/01/2016</td>
<td>$33.38</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.77</td>
</tr>
<tr>
<td>OPERATING ENGINEERS LOCAL 98</td>
<td>12/01/2016</td>
<td>$33.78</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.64</td>
</tr>
<tr>
<td></td>
<td>06/01/2017</td>
<td>$34.39</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$57.52</td>
</tr>
<tr>
<td></td>
<td>12/01/2017</td>
<td>$34.99</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$58.39</td>
</tr>
<tr>
<td></td>
<td>06/01/2018</td>
<td>$35.60</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$59.27</td>
</tr>
<tr>
<td></td>
<td>12/01/2018</td>
<td>$36.20</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$60.14</td>
</tr>
<tr>
<td></td>
<td>06/01/2019</td>
<td>$36.71</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.92</td>
</tr>
<tr>
<td></td>
<td>12/01/2019</td>
<td>$37.31</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.79</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

| PUMP OPERATOR (DEWATERING, OTHER)     | 06/01/2016     | $32.85    | $10.38 | $12.01  | $0.00                     | $55.24     |
| OPERATING ENGINEERS LOCAL 98          | 12/01/2016     | $33.25    | $10.58 | $12.28  | $0.00                     | $56.11     |
|                                        | 06/01/2017     | $33.86    | $10.58 | $12.55  | $0.00                     | $56.99     |
|                                        | 12/01/2017     | $34.46    | $10.58 | $12.82  | $0.00                     | $57.86     |
|                                        | 06/01/2018     | $35.07    | $10.58 | $13.09  | $0.00                     | $58.74     |
|                                        | 12/01/2018     | $35.67    | $10.58 | $13.36  | $0.00                     | $59.61     |
|                                        | 06/01/2019     | $36.18    | $10.58 | $13.63  | $0.00                     | $60.39     |
|                                        | 12/01/2019     | $36.78    | $10.58 | $13.90  | $0.00                     | $61.26     |

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.

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

### Apprentice - CARPENTER (Residential Wood Frame) - 108 Hampden Hampshire

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/29/2016</td>
<td>$16.09</td>
<td>$7.20</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$23.29</td>
</tr>
<tr>
<td>60</td>
<td>$16.09</td>
<td>$7.20</td>
<td>$5.35</td>
<td>$0.00</td>
<td>$28.64</td>
</tr>
<tr>
<td>65</td>
<td>$17.43</td>
<td>$7.20</td>
<td>$5.35</td>
<td>$0.00</td>
<td>$29.98</td>
</tr>
<tr>
<td>70</td>
<td>$18.77</td>
<td>$7.20</td>
<td>$5.35</td>
<td>$0.00</td>
<td>$31.32</td>
</tr>
<tr>
<td>75</td>
<td>$20.11</td>
<td>$7.20</td>
<td>$5.35</td>
<td>$0.00</td>
<td>$32.66</td>
</tr>
<tr>
<td>80</td>
<td>$21.45</td>
<td>$7.20</td>
<td>$5.35</td>
<td>$0.00</td>
<td>$34.00</td>
</tr>
<tr>
<td>85</td>
<td>$22.79</td>
<td>$7.20</td>
<td>$5.35</td>
<td>$0.00</td>
<td>$35.34</td>
</tr>
<tr>
<td>90</td>
<td>$24.13</td>
<td>$7.20</td>
<td>$5.35</td>
<td>$0.00</td>
<td>$36.68</td>
</tr>
</tbody>
</table>

** Notes:**

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

** Apprentice to Journeyworker Ratio:**

<table>
<thead>
<tr>
<th>RIDE-ON MOTORIZED BUGGY OPERATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>LABORERS - ZONE 3 (BUILDING &amp; SITE)</td>
</tr>
</tbody>
</table>

<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>06/06/2016</td>
<td>$29.40</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.25</td>
</tr>
<tr>
<td>12/05/2016</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
</tbody>
</table>

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>ROLLER OPERATOR OPERATING ENGINEERS LOCAL 98</td>
<td>06/01/2016</td>
<td>$32.24</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$54.63</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$32.64</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$55.50</td>
</tr>
<tr>
<td></td>
<td>06/01/2017</td>
<td>$33.25</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$56.38</td>
</tr>
<tr>
<td></td>
<td>12/01/2017</td>
<td>$33.85</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$57.25</td>
</tr>
<tr>
<td></td>
<td>06/01/2018</td>
<td>$34.46</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$58.13</td>
</tr>
<tr>
<td></td>
<td>12/01/2018</td>
<td>$35.06</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$59.00</td>
</tr>
<tr>
<td></td>
<td>06/01/2019</td>
<td>$35.57</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$59.78</td>
</tr>
<tr>
<td></td>
<td>12/01/2019</td>
<td>$36.17</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$60.65</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

<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>ROOFER (Coal tar pitch) ROOFERS LOCAL 248</td>
<td>10/16/2016</td>
<td>$32.25</td>
<td>$9.41</td>
<td>$13.25</td>
<td>$0.00</td>
<td>$54.91</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- ROOFER"

<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>ROOFER (Inc.Roof Waterproofing &amp;Roof Damproofing) ROOFERS LOCAL 248</td>
<td>10/16/2016</td>
<td>$31.75</td>
<td>$9.41</td>
<td>$12.75</td>
<td>$0.00</td>
<td>$53.91</td>
</tr>
</tbody>
</table>

Apprentice - ROOFER - Local 248

### Effective Date - 10/16/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>$19.05</td>
<td>$9.41</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$28.46</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>$20.64</td>
<td>$9.41</td>
<td>$12.75</td>
<td>$0.00</td>
<td>$42.80</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$22.23</td>
<td>$9.41</td>
<td>$12.75</td>
<td>$0.00</td>
<td>$44.39</td>
</tr>
<tr>
<td>4</td>
<td>75</td>
<td>$23.81</td>
<td>$9.41</td>
<td>$12.75</td>
<td>$0.00</td>
<td>$45.97</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>$25.40</td>
<td>$9.41</td>
<td>$12.75</td>
<td>$0.00</td>
<td>$47.56</td>
</tr>
<tr>
<td>6</td>
<td>85</td>
<td>$26.99</td>
<td>$9.41</td>
<td>$12.75</td>
<td>$0.00</td>
<td>$49.15</td>
</tr>
<tr>
<td>7</td>
<td>90</td>
<td>$28.58</td>
<td>$9.41</td>
<td>$12.75</td>
<td>$0.00</td>
<td>$50.74</td>
</tr>
<tr>
<td>8</td>
<td>95</td>
<td>$30.16</td>
<td>$9.41</td>
<td>$12.75</td>
<td>$0.00</td>
<td>$52.32</td>
</tr>
</tbody>
</table>

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

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>ROOFER SLATE / TILE / PRECAST CONCRETE ROOFERS LOCAL 248</td>
<td>10/16/2016</td>
<td>$32.25</td>
<td>$9.41</td>
<td>$13.25</td>
<td>$0.00</td>
<td>$54.91</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- ROOFER"

<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>SCRAPER OPERATING ENGINEERS LOCAL 98</td>
<td>06/01/2016</td>
<td>$32.85</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$55.24</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$33.25</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$56.11</td>
</tr>
<tr>
<td></td>
<td>06/01/2017</td>
<td>$33.86</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$56.99</td>
</tr>
<tr>
<td></td>
<td>12/01/2017</td>
<td>$34.46</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$57.86</td>
</tr>
<tr>
<td></td>
<td>06/01/2018</td>
<td>$35.07</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$58.74</td>
</tr>
<tr>
<td></td>
<td>12/01/2018</td>
<td>$35.67</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$59.61</td>
</tr>
<tr>
<td></td>
<td>06/01/2019</td>
<td>$36.18</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$60.39</td>
</tr>
<tr>
<td></td>
<td>12/01/2019</td>
<td>$36.78</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$61.26</td>
</tr>
</tbody>
</table>

For apprentice rates see "Apprentice- OPERATING ENGINEERS"
<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OPERATING ENGINEERS LOCAL 98</td>
<td>06/01/2016</td>
<td>$32.24</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$54.63</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$32.64</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$55.50</td>
</tr>
<tr>
<td></td>
<td>06/01/2017</td>
<td>$33.25</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$56.38</td>
</tr>
<tr>
<td></td>
<td>12/01/2017</td>
<td>$33.85</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$57.25</td>
</tr>
<tr>
<td></td>
<td>06/01/2018</td>
<td>$34.46</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$58.13</td>
</tr>
<tr>
<td></td>
<td>12/01/2018</td>
<td>$35.06</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$59.00</td>
</tr>
<tr>
<td></td>
<td>06/01/2019</td>
<td>$35.57</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$59.78</td>
</tr>
<tr>
<td></td>
<td>12/01/2019</td>
<td>$36.17</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$60.65</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- OPERATING ENGINEERS&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SELF-PROPELLED POWER BROOM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OPERATING ENGINEERS LOCAL 98</td>
<td>06/01/2016</td>
<td>$29.62</td>
<td>$10.38</td>
<td>$12.01</td>
<td>$0.00</td>
<td>$52.01</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$30.02</td>
<td>$10.58</td>
<td>$12.28</td>
<td>$0.00</td>
<td>$52.88</td>
</tr>
<tr>
<td></td>
<td>06/01/2017</td>
<td>$30.63</td>
<td>$10.58</td>
<td>$12.55</td>
<td>$0.00</td>
<td>$53.76</td>
</tr>
<tr>
<td></td>
<td>12/01/2017</td>
<td>$31.23</td>
<td>$10.58</td>
<td>$12.82</td>
<td>$0.00</td>
<td>$54.63</td>
</tr>
<tr>
<td></td>
<td>06/01/2018</td>
<td>$31.84</td>
<td>$10.58</td>
<td>$13.09</td>
<td>$0.00</td>
<td>$55.51</td>
</tr>
<tr>
<td></td>
<td>12/01/2018</td>
<td>$32.44</td>
<td>$10.58</td>
<td>$13.36</td>
<td>$0.00</td>
<td>$56.38</td>
</tr>
<tr>
<td></td>
<td>06/01/2019</td>
<td>$32.95</td>
<td>$10.58</td>
<td>$13.63</td>
<td>$0.00</td>
<td>$57.16</td>
</tr>
<tr>
<td></td>
<td>12/01/2019</td>
<td>$33.55</td>
<td>$10.58</td>
<td>$13.90</td>
<td>$0.00</td>
<td>$58.03</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- OPERATING ENGINEERS&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHEETMETAL WORKER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHEETMETAL WORKERS LOCAL 63</td>
<td>07/01/2016</td>
<td>$32.28</td>
<td>$10.54</td>
<td>$14.90</td>
<td>$1.70</td>
<td>$59.42</td>
</tr>
<tr>
<td></td>
<td>01/01/2017</td>
<td>$33.03</td>
<td>$10.54</td>
<td>$14.90</td>
<td>$1.70</td>
<td>$60.17</td>
</tr>
</tbody>
</table>
### SHEET METAL WORKER - Local 63

#### Effective Date: 07/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>$14.53</td>
<td>$6.21</td>
<td>$4.10</td>
<td>$0.00</td>
<td>$24.84</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>$16.14</td>
<td>$6.55</td>
<td>$4.55</td>
<td>$0.00</td>
<td>$27.24</td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>$17.75</td>
<td>$6.89</td>
<td>$8.19</td>
<td>$0.98</td>
<td>$33.81</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>$19.37</td>
<td>$7.22</td>
<td>$8.19</td>
<td>$1.04</td>
<td>$35.82</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>$20.98</td>
<td>$7.55</td>
<td>$8.19</td>
<td>$1.10</td>
<td>$37.82</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>$22.60</td>
<td>$7.88</td>
<td>$8.19</td>
<td>$1.16</td>
<td>$39.83</td>
</tr>
<tr>
<td>7</td>
<td>75</td>
<td>$24.21</td>
<td>$8.22</td>
<td>$8.19</td>
<td>$1.22</td>
<td>$41.84</td>
</tr>
<tr>
<td>8</td>
<td>80</td>
<td>$25.82</td>
<td>$9.30</td>
<td>$13.99</td>
<td>$1.47</td>
<td>$50.58</td>
</tr>
<tr>
<td>9</td>
<td>85</td>
<td>$27.44</td>
<td>$9.64</td>
<td>$13.99</td>
<td>$1.53</td>
<td>$52.60</td>
</tr>
<tr>
<td>10</td>
<td>90</td>
<td>$29.05</td>
<td>$9.98</td>
<td>$13.99</td>
<td>$1.59</td>
<td>$54.61</td>
</tr>
</tbody>
</table>

#### Effective Date: 01/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>$14.86</td>
<td>$6.21</td>
<td>$4.10</td>
<td>$0.00</td>
<td>$25.17</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>$16.52</td>
<td>$6.55</td>
<td>$4.55</td>
<td>$0.00</td>
<td>$27.62</td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>$18.17</td>
<td>$6.89</td>
<td>$8.19</td>
<td>$1.00</td>
<td>$34.25</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>$19.82</td>
<td>$7.22</td>
<td>$8.19</td>
<td>$1.06</td>
<td>$36.29</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>$21.47</td>
<td>$7.55</td>
<td>$8.19</td>
<td>$1.12</td>
<td>$38.33</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>$23.12</td>
<td>$7.88</td>
<td>$8.19</td>
<td>$1.18</td>
<td>$40.37</td>
</tr>
<tr>
<td>7</td>
<td>75</td>
<td>$24.77</td>
<td>$8.22</td>
<td>$8.19</td>
<td>$1.24</td>
<td>$42.42</td>
</tr>
<tr>
<td>8</td>
<td>80</td>
<td>$26.42</td>
<td>$9.30</td>
<td>$13.99</td>
<td>$1.49</td>
<td>$51.20</td>
</tr>
<tr>
<td>9</td>
<td>85</td>
<td>$28.08</td>
<td>$9.64</td>
<td>$13.99</td>
<td>$1.55</td>
<td>$53.26</td>
</tr>
<tr>
<td>10</td>
<td>90</td>
<td>$29.73</td>
<td>$9.98</td>
<td>$13.99</td>
<td>$1.61</td>
<td>$55.31</td>
</tr>
</tbody>
</table>

#### Notes:
- Apprentice to Journeyworker Ratio: 1:3

### SIGN ERECTOR

**PAINTERS LOCAL 35 - ZONE 3**

<p>| Issue Date: 10/20/2016 | Wage Request Number: 20161020-031 | Page 28 of 34 |</p>
<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$12.91</td>
<td>$7.07</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$19.98</td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>$14.20</td>
<td>$7.07</td>
<td>$2.45</td>
<td>$0.00</td>
<td>$23.72</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>$15.49</td>
<td>$7.07</td>
<td>$2.45</td>
<td>$0.00</td>
<td>$25.01</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>$16.78</td>
<td>$7.07</td>
<td>$2.45</td>
<td>$0.00</td>
<td>$26.30</td>
</tr>
<tr>
<td>5</td>
<td>70</td>
<td>$18.07</td>
<td>$7.07</td>
<td>$7.05</td>
<td>$0.00</td>
<td>$32.19</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>$19.36</td>
<td>$7.07</td>
<td>$7.05</td>
<td>$0.00</td>
<td>$33.48</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>$20.65</td>
<td>$7.07</td>
<td>$7.05</td>
<td>$0.00</td>
<td>$34.77</td>
</tr>
<tr>
<td>8</td>
<td>85</td>
<td>$21.94</td>
<td>$7.07</td>
<td>$7.05</td>
<td>$0.00</td>
<td>$36.06</td>
</tr>
<tr>
<td>9</td>
<td>90</td>
<td>$23.23</td>
<td>$7.07</td>
<td>$7.05</td>
<td>$0.00</td>
<td>$37.35</td>
</tr>
</tbody>
</table>

Notes: Steps are 4 mos.

Apprentice - SIGN ERECTOR - Local 35 Zone 3
Effective Date - 06/01/2013

Apprentice to Journeyworker Ratio: 1:1
### SPRINKLER FITTER - Local 669

#### Effective Date: 04/01/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>$17.55</td>
<td>$7.45</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$25.00</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>$19.51</td>
<td>$7.45</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$26.96</td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>$21.46</td>
<td>$8.77</td>
<td>$6.30</td>
<td>$0.00</td>
<td>$36.53</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>$23.41</td>
<td>$8.77</td>
<td>$6.30</td>
<td>$0.00</td>
<td>$38.48</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>$25.36</td>
<td>$8.77</td>
<td>$6.55</td>
<td>$0.00</td>
<td>$40.68</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>$27.31</td>
<td>$8.77</td>
<td>$6.55</td>
<td>$0.00</td>
<td>$42.63</td>
</tr>
<tr>
<td>7</td>
<td>75</td>
<td>$29.26</td>
<td>$8.77</td>
<td>$6.55</td>
<td>$0.00</td>
<td>$44.58</td>
</tr>
<tr>
<td>8</td>
<td>80</td>
<td>$31.21</td>
<td>$8.77</td>
<td>$6.55</td>
<td>$0.00</td>
<td>$46.53</td>
</tr>
<tr>
<td>9</td>
<td>85</td>
<td>$33.16</td>
<td>$8.77</td>
<td>$6.55</td>
<td>$0.00</td>
<td>$48.48</td>
</tr>
<tr>
<td>10</td>
<td>90</td>
<td>$35.11</td>
<td>$8.77</td>
<td>$6.55</td>
<td>$0.00</td>
<td>$50.43</td>
</tr>
</tbody>
</table>

#### Effective Date: 01/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>$17.55</td>
<td>$7.60</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$25.15</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>$19.51</td>
<td>$7.60</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$27.11</td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>$21.46</td>
<td>$9.17</td>
<td>$6.45</td>
<td>$0.00</td>
<td>$37.08</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>$23.41</td>
<td>$9.17</td>
<td>$6.45</td>
<td>$0.00</td>
<td>$39.03</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>$25.36</td>
<td>$9.17</td>
<td>$6.70</td>
<td>$0.00</td>
<td>$41.23</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>$27.31</td>
<td>$9.17</td>
<td>$6.70</td>
<td>$0.00</td>
<td>$43.18</td>
</tr>
<tr>
<td>7</td>
<td>75</td>
<td>$29.26</td>
<td>$9.17</td>
<td>$6.70</td>
<td>$0.00</td>
<td>$45.13</td>
</tr>
<tr>
<td>8</td>
<td>80</td>
<td>$31.21</td>
<td>$9.17</td>
<td>$6.70</td>
<td>$0.00</td>
<td>$47.08</td>
</tr>
<tr>
<td>9</td>
<td>85</td>
<td>$33.16</td>
<td>$9.17</td>
<td>$6.70</td>
<td>$0.00</td>
<td>$49.03</td>
</tr>
<tr>
<td>10</td>
<td>90</td>
<td>$35.11</td>
<td>$9.17</td>
<td>$6.70</td>
<td>$0.00</td>
<td>$50.98</td>
</tr>
</tbody>
</table>

### Notes:

Apprentice to Journeyworker Ratio: 1:1

#### TELECOMMUNICATION TECHNICIAN

<table>
<thead>
<tr>
<th>Issue 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>07/03/2016</td>
<td>$39.11</td>
<td>$9.35</td>
<td>$10.32</td>
<td>$0.00</td>
<td>$58.78</td>
</tr>
<tr>
<td>01/01/2017</td>
<td>$40.01</td>
<td>$9.35</td>
<td>$10.32</td>
<td>$0.00</td>
<td>$59.68</td>
</tr>
</tbody>
</table>
### Apprentices - TELECOMMUNICATION TECHNICIAN - Local 7

#### Effective Date - 07/03/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>$15.64</td>
<td>$5.00</td>
<td>$0.47</td>
<td>$0.00</td>
<td>$21.11</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>$17.60</td>
<td>$5.00</td>
<td>$0.53</td>
<td>$0.00</td>
<td>$23.13</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>$19.56</td>
<td>$9.35</td>
<td>$6.04</td>
<td>$0.00</td>
<td>$34.95</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>55</td>
<td>$21.51</td>
<td>$9.35</td>
<td>$6.10</td>
<td>$0.00</td>
<td>$36.96</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>$25.42</td>
<td>$9.35</td>
<td>$7.21</td>
<td>$0.00</td>
<td>$41.98</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>$27.38</td>
<td>$9.35</td>
<td>$8.27</td>
<td>$0.00</td>
<td>$45.00</td>
<td></td>
</tr>
</tbody>
</table>

#### Effective Date - 01/01/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>$16.00</td>
<td>$5.00</td>
<td>$0.48</td>
<td>$0.00</td>
<td>$21.48</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>$18.00</td>
<td>$5.00</td>
<td>$0.54</td>
<td>$0.00</td>
<td>$23.54</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>$20.01</td>
<td>$9.35</td>
<td>$6.05</td>
<td>$0.00</td>
<td>$35.41</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>55</td>
<td>$22.01</td>
<td>$9.35</td>
<td>$6.11</td>
<td>$0.00</td>
<td>$37.47</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>$26.01</td>
<td>$9.35</td>
<td>$7.23</td>
<td>$0.00</td>
<td>$42.59</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>$28.01</td>
<td>$9.35</td>
<td>$8.29</td>
<td>$0.00</td>
<td>$45.65</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Steps are 800 hours
- Apprentice to Journeyworker Ratio: 1:1

### TERRAZZO FINISHERS

**BRICKLAYERS LOCAL 3 (SPR/PITT) - MARBLE & TILE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/05/2016</td>
<td>$32.67</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$59.90</td>
</tr>
<tr>
<td>02/27/2017</td>
<td>$33.24</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$60.47</td>
</tr>
</tbody>
</table>
## Classification

**Apprentice - MARBLE-TILE-TERRAZZO FINISHER-Local 3 Marble/Tile (Spr/Pitt)**

### Effective Date - 09/05/2016

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$16.34</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$43.57</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>$19.60</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$46.83</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$22.87</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$50.10</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$26.14</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$53.37</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
<td>$29.40</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$56.63</td>
</tr>
</tbody>
</table>

### Effective Date - 02/27/2017

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>$16.62</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$43.85</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>$19.94</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$47.17</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$23.27</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$50.50</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>$26.59</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$53.82</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
<td>$29.92</td>
<td>$10.18</td>
<td>$17.05</td>
<td>$0.00</td>
<td>$57.15</td>
</tr>
</tbody>
</table>

### Notes:

Apprentice to Journeyworker Ratio: 1:5

---

**TEST BORING DRILLER**

LABORERS - FOUNDATION AND MARINE

For apprentice rates see "Apprentice- LABORER"

06/01/2016 | $37.20 | $7.45 | $14.00 | $0.00 | $58.65
12/01/2016 | $38.20 | $7.45 | $14.00 | $0.00 | $59.65

**TEST BORING DRILLER HELPER**

LABORERS - FOUNDATION AND MARINE

For apprentice rates see "Apprentice- LABORER"

06/01/2016 | $35.92 | $7.45 | $14.00 | $0.00 | $57.37
12/01/2016 | $36.92 | $7.45 | $14.00 | $0.00 | $58.37

**TEST BORING LABORER**

LABORERS - FOUNDATION AND MARINE

For apprentice rates see "Apprentice- LABORER"

06/01/2016 | $35.80 | $7.45 | $14.00 | $0.00 | $57.25
12/01/2016 | $36.80 | $7.45 | $14.00 | $0.00 | $58.25

**TRACTORS**

OPERATING ENGINEERS LOCAL 98

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

06/01/2016 | $32.24 | $10.38 | $12.01 | $0.00 | $54.63
12/01/2016 | $32.64 | $10.58 | $12.28 | $0.00 | $55.50
06/01/2017 | $33.25 | $10.58 | $12.55 | $0.00 | $56.38
12/01/2017 | $33.85 | $10.58 | $12.82 | $0.00 | $57.25
06/01/2018 | $34.46 | $10.58 | $13.09 | $0.00 | $58.13
12/01/2018 | $35.06 | $10.58 | $13.36 | $0.00 | $59.00
06/01/2019 | $35.57 | $10.58 | $13.63 | $0.00 | $59.78
12/01/2019 | $36.17 | $10.58 | $13.90 | $0.00 | $60.65

**TRAILERS FOR EARTH MOVING EQUIPMENT**

TEAMSTERS JOINT COUNCIL NO. 10 ZONE B

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

08/01/2016 | $33.02 | $10.91 | $10.08 | $0.00 | $54.01
12/01/2016 | $33.02 | $10.91 | $10.89 | $0.00 | $54.82

**TUNNEL WORK - COMPRESSED AIR**

LABORERS (COMPRESSED AIR)

For apprentice rates see "Apprentice- LABORER"

06/01/2016 | $48.08 | $7.45 | $14.40 | $0.00 | $69.93
12/01/2016 | $49.08 | $7.45 | $14.40 | $0.00 | $70.93

**TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)**

LABORERS (COMPRESSED AIR)

06/01/2016 | $50.08 | $7.45 | $14.40 | $0.00 | $71.93
12/01/2016 | $51.08 | $7.45 | $14.40 | $0.00 | $72.93
<table>
<thead>
<tr>
<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>TUNNEL WORK - FREE AIR (FREE AIR TUNNEL) LABORERS</td>
<td>06/01/2016</td>
<td>$40.15</td>
<td>$7.45</td>
<td>$14.40</td>
<td>$0.00</td>
<td>$62.00</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$41.15</td>
<td>$7.45</td>
<td>$14.40</td>
<td>$0.00</td>
<td>$63.00</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- LABORER&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TUNNEL WORK - FREE AIR (HAZ. WASTE) LABORERS (FREE AIR TUNNEL)</td>
<td>06/01/2016</td>
<td>$42.15</td>
<td>$7.45</td>
<td>$14.40</td>
<td>$0.00</td>
<td>$64.00</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$43.15</td>
<td>$7.45</td>
<td>$14.40</td>
<td>$0.00</td>
<td>$65.00</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- LABORER&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAC-HAUL TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</td>
<td>08/01/2016</td>
<td>$32.44</td>
<td>$10.91</td>
<td>$10.08</td>
<td>$0.00</td>
<td>$53.43</td>
</tr>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$32.44</td>
<td>$10.91</td>
<td>$10.89</td>
<td>$0.00</td>
<td>$54.24</td>
</tr>
<tr>
<td>WAGON DRILL OPERATOR 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>
</tr>
<tr>
<td></td>
<td>12/05/2016</td>
<td>$30.08</td>
<td>$7.45</td>
<td>$12.40</td>
<td>$0.00</td>
<td>$49.93</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- LABORER&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAGON DRILL OPERATOR (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>
<tr>
<td></td>
<td>12/01/2016</td>
<td>$30.00</td>
<td>$7.45</td>
<td>$10.52</td>
<td>$0.00</td>
<td>$47.97</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- LABORER (Heavy and Highway)&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WATER METER INSTALLER PLUMBERS &amp; PIPEFITTERS LOCAL 104</td>
<td>03/17/2016</td>
<td>$38.26</td>
<td>$8.45</td>
<td>$15.05</td>
<td>$0.00</td>
<td>$61.76</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- PLUMBER/PIPEFITTER&quot; or &quot;PLUMBER/GASFITTER&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside Electrical - West</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EQUIPMENT OPERATOR OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<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>
<tr>
<td>For apprentice rates see &quot;Apprentice- LINEMAN&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROUNDMAN OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td>08/30/2015</td>
<td>$28.87</td>
<td>$8.20</td>
<td>$8.87</td>
<td>$0.00</td>
<td>$45.94</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- LINEMAN&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROUNDMAN / TRUCK DRIVER OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td>08/30/2015</td>
<td>$37.73</td>
<td>$8.20</td>
<td>$9.13</td>
<td>$0.00</td>
<td>$55.06</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- LINEMAN&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAVY EQUIPMENT OPERATOR OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td>08/30/2015</td>
<td>$44.37</td>
<td>$8.20</td>
<td>$9.33</td>
<td>$0.00</td>
<td>$61.90</td>
</tr>
<tr>
<td>For apprentice rates see &quot;Apprentice- LINEMAN&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JOURNEYMAN LINEMAN OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td>08/30/2015</td>
<td>$48.80</td>
<td>$8.20</td>
<td>$9.46</td>
<td>$0.00</td>
<td>$66.46</td>
</tr>
</tbody>
</table>

### Apprentice - LINEMAN (Outside Electrical) - West Local 42

<table>
<thead>
<tr>
<th>Step</th>
<th>percent</th>
<th>Apprentice Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>$29.28</td>
<td>$8.20</td>
<td>$0.88</td>
<td>$0.00</td>
<td>$38.36</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>$31.72</td>
<td>$8.20</td>
<td>$0.95</td>
<td>$0.00</td>
<td>$40.87</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>$34.16</td>
<td>$8.20</td>
<td>$0.92</td>
<td>$0.00</td>
<td>$51.38</td>
</tr>
<tr>
<td>4</td>
<td>75</td>
<td>$36.60</td>
<td>$8.20</td>
<td>$0.94</td>
<td>$0.00</td>
<td>$53.90</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>$39.04</td>
<td>$8.20</td>
<td>$0.97</td>
<td>$0.00</td>
<td>$56.41</td>
</tr>
<tr>
<td>6</td>
<td>85</td>
<td>$41.48</td>
<td>$8.20</td>
<td>$0.99</td>
<td>$0.00</td>
<td>$58.92</td>
</tr>
<tr>
<td>7</td>
<td>90</td>
<td>$43.92</td>
<td>$8.20</td>
<td>$1.02</td>
<td>$0.00</td>
<td>$61.44</td>
</tr>
</tbody>
</table>

### Notes:

Apprentice to Journeyworker Ratio: 1:2
### Classification Table

<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>TELEDATA CABLE SPICER</td>
<td>01/01/2016</td>
<td>$28.98</td>
<td>$4.25</td>
<td>$3.12</td>
<td>$0.00</td>
<td>$36.35</td>
</tr>
<tr>
<td>OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TELEDATA LINEMAN/EQUIPMENT OPERATOR</td>
<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>
<tr>
<td>OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TELEDATA WIREMAN/INSTALLER/TECHNICIAN</td>
<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>
<tr>
<td>OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRACTOR-TRAILER DRIVER</td>
<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>
<tr>
<td>OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TREE TRIMMER</td>
<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>
<tr>
<td>OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TREE TRIMMER GROUNDMAN</td>
<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>
<tr>
<td>OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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.

Additional Apprentice Information:

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

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

All steps are six months (1000 hours.)

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

** Multiple ratios are listed in the comment field.

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

**** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.
WEIGHTLY PAYROLL RECORDS REPORT  
& STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c149, section 27B, a true and accurate record must be kept of all persons employed on the public works construction project for which the enclosed rates have been provided. The Weekly Payroll Report Form includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the project.

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. This is required to be done on a weekly basis. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor or public body shall furnish to the Executive Office of Labor within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:
STATEMENT OF COMPLIANCE

Date: _____ / _____ / 20____

I, ______________________________________________________________________

________________________________________________________________________

(Name of signatory party) (Title)

do hereby state:

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

________________________________________________________________________

________________________________________________________________________

(Contractor, subcontractor or public body) (Building or project)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed
on said project have been paid in accordance with wages determined under the
provisions of sections twenty-six and twenty-seven of chapter one hundred and forty
nine of the General Laws.

Signature __________________________________________________________________

Title _____________________________________________________________________
### QUARTERLY PROJECTED WORKFORCE TABLE

**UNIVERSITY OF MASSACHUSETTS AMHERST**

<table>
<thead>
<tr>
<th>Field</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMA Number</td>
<td></td>
</tr>
<tr>
<td>Project No.</td>
<td></td>
</tr>
<tr>
<td>Project Name</td>
<td></td>
</tr>
<tr>
<td>Name of Contractor</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td></td>
</tr>
<tr>
<td>Telephone No</td>
<td></td>
</tr>
<tr>
<td>Fax</td>
<td></td>
</tr>
<tr>
<td>Scope of Work</td>
<td></td>
</tr>
<tr>
<td>Trades Utilized</td>
<td></td>
</tr>
<tr>
<td>Estimate of Total Hours to Complete Work of Project</td>
<td></td>
</tr>
<tr>
<td>Estimate of Total Hours of Work Remaining on Project</td>
<td></td>
</tr>
<tr>
<td>Total Contract Dollar Value $</td>
<td></td>
</tr>
<tr>
<td>Quarter: Beginning: Ending</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>MONTH-</td>
<td></td>
</tr>
<tr>
<td>Laborers</td>
<td></td>
</tr>
<tr>
<td>Other Trades</td>
<td></td>
</tr>
<tr>
<td>MONTH-</td>
<td></td>
</tr>
<tr>
<td>Laborers</td>
<td></td>
</tr>
<tr>
<td>Other Trades</td>
<td></td>
</tr>
<tr>
<td>MONTH-</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______________________________

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>$</td>
</tr>
<tr>
<td>☐ MBE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ WBE</td>
<td>$</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
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 ____.
(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

A
G
E
N
C
Y

U
S
E

A
N
D

O
C
C
U
P
A
N
C
Y

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: [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 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).

☐ 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 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(tt). 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.

199
BID PACKAGE

PART IV

SUPPLEMENTARY GENERAL

CONDITIONS

AND

SPECIFICATIONS
UNIVERSITY OF MASSACHUSETTS
AMHERST, MASSACHUSETTS

FACILITIES & CAMPUS SERVICES

SOUTHWEST TOWER ENTRY VESTIBULE AND LOWRISE LOUNGE IMPROVEMENTS

UMA 17-05, PROJECT NO. 15-1004683

TIMOTHY MURPHY ARCHITECTS

380 HIGH STREET
HOLYOKE, MA 01040
413-532-7464
tjm@murphyarch.com

OCTOBER 18, 2016
TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

011000 SUMMARY
013100 PROJECT MANAGEMENT AND COORDINATION
013200 CONSTRUCTION PROGRESS DOCUMENTATION
013300 SUBMITTAL REQUIREMENTS
014000 QUALITY REQUIREMENTS
015000 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
016000 PRODUCT REQUIREMENTS
017700 CONTRACT CLOSEOUT

DIVISION 02 - EXISTING CONDITIONS

020800 ASBESTOS ABATEMENT
020810 DISTURBANCE OF LEAD, CADMIUM & CHROMIUM MATERIALS
024100 SELECTIVE DEMOLITION

DIVISION 03 - CONCRETE

035410 CEMENTITIOUS UNDERLAYMENT
039030 CONCRETE REPAIR

DIVISION 05 - METALS

055000 METAL FABRICATIONS

DIVISION 06 - WOOD, PLASTICS, & COMPOSITES

061005 MISCELLANEOUS CARPENTRY
062000 FINISH CARPENTRY

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

079000 JOINT SEALANTS

DIVISION 08 - OPENINGS

084115 ALUMINUM FRAMED ENTRANCES, STOREFRONTS, AND WINDOWS
087100 HARDWARE
088001 GLASS AND GLAZING (Filed Sub-Bid)

DIVISION 09 - FINISHES

093000 TILING
096550 RESILIENT WALL BASE
096900 CARPET TILE
099001 PAINTING (Filed Sub-Bid)
DIVISION 12 - FURNISHINGS

124813 ENTRANCE FLOOR MATS
125120 VERTICAL LOUVER BLINDS

DIVISION 23 - HEATING, VENTILATION, & AIR CONDITIONING

230001 HEATING, VENTILATION, & AIR CONDITIONING (Filed Sub-Bid)

DIVISION 26 - ELECTRICAL

260001 ELECTRICAL (Filed Sub-Bid)
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. General Contractor’s Qualifications.
D. Contract Method.
E. Work Sequence.
F. Supervision of Work.
G. General Contractor’s Use of Premises.
H. Coordination.
I. Field Engineering.
J. Reference Standards.
K. Preconstruction Conference.
L. Project Meetings.
M. Permits, Inspection, and Testing Required by Governing Authorities.
N. Cutting, Coring, Patching, Unless Otherwise Indicated.
O. Debris Removal.
P. Field Measurements.
Q. Emergency Procedures.
R. Safety Regulations.

S. OSHA Safety and Health Course Documentation.

T. Damage Responsibility.

U. Owner Furnished Products.

V. Owner Occupancy.

W. Asbestos and Hazardous Materials Discovery.

X. Special Requirements.

Y. List of Drawings.

1.3 WORK UNDER THIS CONTRACT

The work to be done under this contract consists of executing and completing all work required for Project #15-1004683, SOUTHWEST TOWER ENTRY VESTIBULE AND LOWRISE LOUNGE IMPROVEMENTS, UNIVERSITY OF MASSACHUSETTS, AMHERST.

1. General Information
   a. The project consists of renovations at eight dormitory buildings.

B. The work will include all operations necessary to deliver the buildings and ancillary on and off site amenities in a fully installed and operable condition including obtaining all necessary permits.

C. 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 a renovation project including, but not limited to
      a. Asbestos abatement and lead paint management
      b. Aluminum entrances
      c. Aluminum storefront and windows
      d. Painting
      e. Tile flooring
      f. Entrance mat
      g. Finish carpentry
      h. Vertical blinds
      i. New hot water heating
      j. New electrical control devices

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

E. The Massachusetts Standard Labor Wage rates, as outlined in the exhibits, will be used in the construction of this project.
1.4 EXAMINATION OF SITE AND DOCUMENTS

A. A pre-bid conference will be held at the UMASS Campus on the date and at the time indicated in the Invitation to Bid.

B. 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.

C. 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 subsequent to the submission of the bid shall be directed to: Timothy Murphy Architects / Jodi Poplawski / jmp@murphyarch.com.

D. No questions from Bidders will be accepted within 5 days of the Bid receipt. 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 GENERAL CONTRACTOR’S QUALIFICATION

A. The General Contractor must be currently certified by the Division of Capital Asset Management (DCAM) for Painting.

B. The General Contractor shall certify in writing that he has successfully performed on at least three construction projects of equivalent size and complexity.

C. The General Contractor’s Updated Statement is not a public record as defined in M.G.L., Chapter 4, Section 7, and will not be open to public inspection.

1.6 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.

1.7 WORK SEQUENCE

A. Vestibule Improvements

1. The vestibule improvement work shall be scheduled one vestibule at a time to allow for fire egress. No work shall begin on the second vestibule until the first is completed and approved by the Architect and UMA.

2. During construction each vestibule shall be properly and securely enclosed to prevent intrusion by weather and unauthorized personnel into the building.
3. The vestibule improvement work shall be scheduled by building as follows:
   a. Kennedy House Building #352
   b. Coolidge House Building #353
   c. John Quincy Adams House Building #355
   d. John Adams House Building #354
   e. Washington House Building #356

4. Construct, secure, and weathertight exterior vestibule and interior lobby enclosure to facilitate all work associated with vestibule.

5. Prior to remediation and abatement work inventory, tag, and catalog all existing door hardware and access control devices. Disconnect and remove components from entrances prior to demolition work. Refer to drawings and specifications for more information.

6. Note other projects will be in progress in buildings 354 and 356. Contractor will have to coordinate work with contractors already on site.

B. PCB Remediation and Asbestos Abatement

1. The PCB remediation and asbestos abatement work shall be scheduled one vestibule at a time. Work at each vestibule shall be as follows:
   a. Construct vestibule containment to facilitate PCB remediation and asbestos abatement.
   b. Construct containment at basement level mechanical room to facilitate abatement of mechanical equipment.
   c. Proceed with PCB remediation and asbestos abatement work removing sealant and peeling or damaged skim coat as specified in Section 020800 Asbestos Abatement.
   d. Demolish exterior and interior doors, frames, and material identified as contaminated hazardous material.
   e. Complete all remaining demolition work associated with vestibule under containment.
   f. Prepare substrate and apply encapsulant product as indicated and as specified. Allow 3 – 5 days for curing of product.

C. New Work

1. Coordinate installation of new flooring, doors and frames, and related hardware and access control devices and appurtenances.

2. All new drilling for and/or fastening of new components through contaminated substrates shall be performed under containment and by proper licensed personnel in accordance with Section 020800 Asbestos Abatement.

3. Complete all work associated with the vestibule as required by the drawings and specifications.

4. Obtain written acceptance of completed work on one vestibule before beginning work on the next.
1.8 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.

1.9 GENERAL CONTRACTOR’S USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Coordinate work of all Subcontractors. 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 access. The Owner will occupy the buildings during the construction period. The Owner will not occupy the rooms or vestibules during the construction period.

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 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.

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 - Construction Facilities and Temporary 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 during the regular work week.
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.
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 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.

1.10 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.
1.11 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.

1.12 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.

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.

1.13 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

1.14 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.
1.15 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. Fenced enclosures are required around dumpsters. 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.
1.16 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.

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 - Construction Facilities and Temporary 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 (CMRR 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 florescent 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.

1.17 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.

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.

1.18 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.

1.19 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 on 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.

1.20 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 1910.146 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 29CFR 1910.146 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 1910.146
   2. 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.
   3. 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.
   4. If University personnel must enter the PRCS, a separate UMass Permit will be issued.

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.

1.21 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.

1.22 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.

1.23 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.

1.24 OWNER 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.

1.25 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.

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.

1.26 SPECIAL REQUIREMENTS

A. The General Contractor shall prepare a Health and Safety Plan that addresses protection of employee and public health and safety.

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.
1.27 LIST OF DRAWINGS

A. T1 TITLE SHEET
   T2 REFERENCE SHEET

ARCHITECTURAL
A1.01 KENNEDY HOUSE - BUILDING NO. 352
A1.02 COOLIDGE HOUSE - BUILDING NO. 353
A1.03 JOHN ADAMS HOUSE - BUILDING NO. 354
A1.04 J.Q. ADAMS HOUSE - BUILDING NO. 355
A1.05 WASHINGTON HOUSE - BUILDING NO. 356
A1.06 CANE HOUSE - BUILDING NO. 400
A1.07 CANE HOUSE - BUILDING NO. 400
A1.08 PIERPONT HOUSE - BUILDING NO. 401
A1.09 PIERPONT HOUSE - BUILDING NO. 401
A1.10 MOORE HOUSE - BUILDING NO. 402
A1.11 MOORE HOUSE - BUILDING NO. 402
A4.01 STUDENT LOUNGE DETAIL PLANS & ELEVATIONS
A4.02 STUDENT LOUNGE DETAIL PLANS & ELEVATIONS
A5.01 STUDENT LOUNGE SECTIONS AND DETAILS
A5.02 VESTIBULE SECTIONS AND DETAILS
A6.01 DOOR SCHEDULE - HIGH RISE ENTRANCES
A6.02 VESTIBULE AND DOOR ELEVATIONS
A6.03 DOOR DETAILS
A6.04 STOREFRONT DETAILS

MECHANICAL
M0.00 MECHANICAL LEGEND AND ABBREVIATIONS
M0.01 MECHANICAL LEGEND, NOTE, & ABBREVIATIONS
MD1.01 MECHANICAL VESTIBULE DEMOLITION
MD1.02 MECHANICAL STUDENT LOUNGE DEMOLITION
M1.01 MECHANICAL VESTIBULE NEW WORK PLANS
M1.02 MECHANICAL STUDENT LOUNGE NEW WORK PLANS
M7.00 MECHANICAL DETAILS
M7.01 MECHANICAL DETAILS
M8.00 MECHANICAL SCHEDULES AND CONTROLS

ELECTRICAL
E0.01 ELECTRICAL NOTES & ABBREVIATIONS
E1.01 KENNEDY HOUSE BUILDING 352
E1.02 COOLIDGE HOUSE BUILDING 353
E1.03 JOHN QUINCY ADAMS HOUSE BUILDING 355
E1.04 WASHINGTON HOUSE BUILDING 356
E1.05 JOHN ADAMS HOUSE BUILDING 354
E1.06 TYPICAL BASEMENT PLAN

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 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:

1. General project coordination procedures.
2. Coordination Drawings.
3. Administrative and supervisory personnel.
4. Project meetings.
5. Contractor List
6. Punch List Requirements

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section 017700 "Contract Closeout" for coordinating Contract closeout.

1.3 COORDINATION

A. Coordination: The General Contractor shall coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

B. The General Contractor shall be solely responsible for site safety and all construction means, methods, techniques, sequences, and procedures for coordinating all portions of the work under the Contract.

C. The General Contractor shall carefully check his own work and that of the Subcontractors as the work is being performed. Unsatisfactory work shall be corrected immediately.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

D. When necessary, the Contractor shall prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
E. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor’s Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Change order requests.
8. Project closeout activities.

F. If the Contractor fails to substantially complete the project by the completion date required by the Contract Documents and as modified by any change orders, the Contractor shall pay liquidated damages, amount as specified in the Notice to Contractors, for each calendar day beyond the contract completion date.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings: The Contractor shall prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Indicate relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Refer to Division 5 Structural Steel and Divisions 15 and 16 Sections for specific Coordination Drawing requirements for mechanical and electrical installations.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. The Contractor shall provide an experienced and responsible licensed project Superintendent. The Superintendent shall be designated by the Contractor as his/her representative and to be in full time attendance at the project site throughout the prosecution and progress of the work.

B. The Contractor shall provide the job Superintendent with a cellular phone, a trailer phone or other means as required to allow for communication with the UMA Project Manager and the UMA Resident Engineer.

C. In addition to the Project Superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other subcontractors.

1.6 PROJECT MEETINGS

A. General: Meetings will be held at the Project site, unless otherwise indicated.
1. Attendees: Participants and others involved, and individuals whose presence is required.
2. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned.

**B. Preconstruction Conference: A pre-construction conference shall be scheduled and chaired by the UMA Project Manager before starting construction. The conference shall be held at the Project site or another convenient location. The purpose of the meeting is to review responsibilities and personnel assignments.**

1. Attendees: UMA Project Manager, Designer, and their consultants; Contractor and his/her Superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that affect progress, including the following:
   
   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing.
   d. Designation of responsible personnel.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for processing Applications for Payment.
   g. Distribution of the Contract Documents.
   h. Submittal procedures.
   i. Preparation of Record Documents.
   j. Use of the premises.
   k. Responsibility for temporary facilities and controls.
   l. Parking and construction limits.
   m. Office, work, and storage areas.
   n. Equipment deliveries and priorities.
   o. First aid.
   q. Progress cleaning.
   r. Working hours.
   s. Emergency phone numbers.
   t. Payment procedures and Schedule of Values.
   u. Material deliveries.

3. 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 Contractors.

**C. Preinstallation Conferences: The General Contractor shall conduct a preinstallation conference at the Project site before each construction activity that requires coordination with other construction.**

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer and UMA Project Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   
b. Options.
c. Related Change Orders.
d. Purchases.
e. Deliveries.
f. Submittals.
g. Review of mockups.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Required performance results.
u. Protection of construction and personnel.

3. The General Contractor shall record significant conference discussions, agreements, and disagreements. Distribute the meeting minutes to everyone concerned, including UMA Project Manager and Designer, within 3 (three) days of the meeting.

4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Progress meetings shall be held at weekly intervals.

1. Attendees: In addition to the UMA 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.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

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

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Manpower.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.
14) Documentation of information for payment requests.

3. Reporting: Project meetings will be chaired by the Designer. Minutes of the project meetings 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 Contractors.

   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Conduct Project coordination meetings at intervals as determined by the Contractor or when requested by the UMA Project Manager. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to the UMA 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.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

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

   b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

   c. Review present and future needs of each contractor present, including the following:

      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Manpower.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.

3. Reporting: The General Contractor shall record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.7 CONTRACTOR AND SUB-CONTRACTOR LIST:

A. At the pre-construction meeting the General Contractor shall provide to the Designer and UMA Project Manager a list containing the following:

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

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 013100
PART 1 - GENERAL

1.1 CONTRACT REFERENCES

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 specification.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
5. RFI Schedule.
6. Field Condition Reports.
7. Special Reports.

B. Related Sections include the following:

1. Section 013300 - Submittal Requirements for submitting schedules and reports.

C. In addition to requirements described below submit all schedules and reports to the Architect electronically.

1.3 SUBMITTALS

A. Submittals Schedule: Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Description of the Work covered.

B. Preliminary Construction Schedule: Submit at preconstruction conference.

C. Contractor's Construction Schedule: Submit initial schedule large enough to show entire schedule for entire construction period.

D. Request For Information (RFI) Schedule: Submit schedule weekly at Progress Meeting.

1. Date and number each submission.

E. Proposed Change Order (PCO) Schedule: Submit schedule weekly at Progress Meeting.

1. Date and number each submission.

F. Field Condition Reports: Submit at time of discovery of differing conditions.

PART 2 - PRODUCTS
2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit initial schedule at Preconstruction Conference.
3. Final Submittal: Submit final submittal schedule at first regularly scheduled progress meeting after the start of construction operations or concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work or the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, interim milestones, Substantial Completion, and Final Completion.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule at the Preconstruction conference.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for the duration of construction.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Submit a comprehensive, fully developed, horizontal bar-chart-type, Contractor's Construction Schedule at the first regularly scheduled progress meeting after the start of construction operations. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

2.5 RFI SCHEDULE

A. General Contractor shall prepare a Request For Information (RFI) Schedule for the Project. At a minimum the RFI Schedule shall contain:

1. Contractor's RFI number.
2. Date of RFI.
3. Identification of requesting Contractor or filed Subcontractor.
4. Description of RFI.
5. Date of Designer's response.
6. Content of Designer's response.

B. Modify the RFI Schedule as requested by the UMA Project Manager or Architect.

C. Update RFI Schedule as required to track RFI's and at a weekly minimum.
D. Submit current RFI Schedule monthly with Pencil Application for Payment.

2.6 PCO SCHEDULE

A. General Contractor shall prepare a Proposed Change Order (PCO) Schedule for the Project. At a minimum the Change Proposal Schedule shall contain:

1. Contractor’s PCO Number.
2. Date of PCO.
3. Amount of PCO.
4. Description of change.
5. Time Extension request.
6. Identification of work by Contractor or filed Sub-Bid Contractor.
7. Date of Designer’s response.
8. Content of Designer’s response.
9. Approved amount of PCO.
10. Length of Time Extension approved.

B. Modify PCO Schedule as requested by UMA Project Manager or Architect.

C. Update Schedule as required to track PCO’s and at a weekly minimum,

D. Submit current PCO Schedule monthly with Pencil Application for Payment.

2.7 REPORTS

A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR’S CONSTRUCTION SCHEDULE

A. Contractor’s Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Designer, UMA Project Manager, separate Contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Attach current, updated, schedule with each Application for payment.

END OF SECTION 013200
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, RFI and PCO logs and schedule of values.

B. Submittals required by and demonstrating compliance with:

1. Section 011000 Summary, Article 1.20 Safety Regulations
2. Section 011000 Summary, Article 1.21 OSHA Safety and Health Course Documentation

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.

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 24-inch by 36-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.

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 SUBMITTAL PROCEDURES

A. The Contractor shall submit all Product Data to the Architect electronically.

1. All emails must have project name as first item in subject line followed by submittal number.

2. Data submitted from a file sharing program, such as Sharefile, will not be accepted.

3. All Product Data shall be specific. Data of a general nature will not be accepted.

4. A separate submittal shall be made for each product.

5. A separate email shall be sent for each submittal.

B. Product Data shall be preceded by one attached transmittal notice. The transmittal notice shall include the following:
1. Project Name and Project Number
2. Date
3. Name and address of the Designer
4. Name and address of the General Contractor
5. Name and address of the Subcontractor
6. Name and address of the Supplier
7. Name of the Manufacturer
8. Item Description
9. Number and title of appropriate Specification Section
10. Submittal Number
   a. Submittals shall be numbered sequentially by section number. For example: if the first submittal under Section 096550 Resilient Wall Base is Wall Base, the submittal number will be 096550-01. If the second submittal under Section 096550 Resilient Wall Base is Wall Base Adhesive, the submittal number will be 096550-02.
11. Product Paragraph Number
   a. Paragraph number shall be obtained from the project manual. For example: if the submittal under Section 096550 Resilient Wall Base is Wall Base, the paragraph number will be 2.2.A. If the submittal under Section 096550 Resilient Wall is Wall Base Adhesive, the paragraph number will be 2.3.C.
12. Drawing number and detail references, as appropriate.
13. Other necessary identification
14. Contractor’s Stamp of Approval
   a. Stamp of Approval shall attest that the submittal has been reviewed for compliance with the specified product or is an equal thereto.

C. Product Data returned by the Architect as “Revise and Resubmit” or “Disapproved” shall be resubmitted as above until the Architect’s approval is obtained.
   1. Resubmittals shall retain the original sequential Section Number with a resubmittal suffix added. For example – if the first submittal under Section 096550 Resilient Wall Base, 096550-01 Wall Base, was returned as Revise and Resubmit or Disapproved the revised submittal would be numbered 096550-01R1. If Submittal 096550-01R1 Wall Base was returned as Revise and Resubmit or Disapproved, the second revised Submittal would be numbered 096550-01R2.

D. When the Product Data are acceptable, the Architect will affix a Submittal Review form to the submittal marked “Approved” or “Approved As Noted” and return the submittal electronically to the Contractor, the Owner, and the Resident Engineer. The Contractor shall distribute the submittal to all effected Subcontractors.
   1. The Contractor shall print the number of copies required to maintain close out submittals including but not limited to O&M Manuals.

E. The Contractor shall maintain one full set of Approved Product Data at the site.
   1. No Revise and Resubmit or Disapproved submittals shall be allowed on the construction site.
   2. The Contractor shall print copies of the approved submittals for his site office if they are not electronically maintained there.

F. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the work concurrently for coordination.
   a. Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

G. Submittal Schedule: Comply with requirements in Section 013200 – Construction Progress Documentation for list of submittals and time requirements for scheduled performance of related construction activities.

H. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Designer’s receipt of submittal.
   1. Initial Review: Allow 14 calendar days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Designer will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Concurrent Review: Where concurrent review of submittals by Designer’s consultants, the University, or other parties is required, allow 14 calendar days for review.
   3. Direct Transmittal to Consultant: If the contract documents indicate that submittals may be transmitted directly to Designer’s consultants, provide duplicate copy of transmittal to Designer and Project Manager. Submittal will be returned to Designer before being returned to the Contractor.
   4. If intermediate submittal is necessary, process it in same manner as initial submittal.
   5. Allow 14 calendar days for processing each resubmittal.
   6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the work to permit processing.

I. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

J. Distribution: Furnish copies of reviewed submittals to manufacturers, Subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating action taken by Design in connection with construction.

1.6 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 submittals 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.

1.7 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 1 - 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 quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor’s quality-control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-control services required by Designer, UMA Project Manager, University, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Section 013200 Construction Progress Documentation for developing a schedule of required tests and inspections.

2. Divisions 2 through 31 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Designer.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Designer.

1.5 REGULATORY REQUIREMENTS

A. Copies of Regulations: Obtain copies of the following regulations and retain at Project site to be available for reference by parties who have a reasonable need:

1. Massachusetts State Building Code

1.6 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by a registered Commonwealth of Massachusetts design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and UMA number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For University’s records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the Commonwealth of Massachusetts and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:
   a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
   d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Designer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Designer or UMA Project Manager.
2. Notify Designer and UMA Project Manager seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Designer and UMA Project Manager approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner’s responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with name, address, and telephone number of testing agency engaged by the University and a description of the types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor’s responsibility, engage a qualified testing agency to perform these quality-control services.
a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 72 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor’s responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor’s responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

1. Testing agency will notify Designer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Designer with copy to Contractor and to authorities having jurisdiction.
3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing agency will retest and reinspect corrected work.

D. Manufacturer’s Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor’s responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Designer, UMA Project Manager and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Designer, UMA Project Manager and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as
requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.

1. Distribution: Distribute schedule to UMA Project Manager, Designer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
2. Comply with the Contract Document requirements for Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000
SECTION 015000
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

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 REQUIREMENTS

A. The following requirements are included in this Section:

1.3 Temporary Water
1.4 Weather Protection
1.5 Heating During Construction
1.6 Temporary Power
1.7 Hoisting Equipment and Machinery
1.8 Staging
1.9 Roof Protection
1.10 Construction Equipment
1.11 Dust Control
1.12 Noise Control
1.13 Enclosures
1.14 Site Enclosure Fence
1.15 Cleaning During Construction
1.16 Project Identification
1.17 Field Offices
1.18 Temporary Sanitary Facilities
1.19 Telephone
1.20 Delivery of Materials
1.21 Shut down Notice
1.22 Construction Cores
1.23 Barricades, Warning Signs and Lights
1.24 Covered Walkways

1.3 TEMPORARY WATER

A. Water will be furnished by the University.

B. Water shall be distributed by means of connections to the permanent service lines and shall
be installed at the expense of the General Contractor.

C. Any temporary pipe lines and connections from the permanent service line, 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 General
Contractor.

D. Use of water may be discontinued by the University, if, in the opinion of the UMA Project
Manager, it is wastefully used.
E. The General Contractor, at his own expense, shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for his employees and those of his Sub-contractors.

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). 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.

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 40 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 Contractor.

C. Within ten (10) 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".

1.5 HEATING DURING CONSTRUCTION

A. None Required.

1.6 TEMPORARY POWER

A. The University will provide electrical energy, to the extent available, required for temporary light and power required for the associated work of the contract. The General Contractor and all Subcontractors, individually, shall furnish all extension cords, sockets, lamps, motors, and accessories required for their work.

B. Any temporary wiring of a special nature shall be paid for by the General Contractor or Subcontractor requiring it.

1.7 HOISTING EQUIPMENT AND MACHINERY

A. None Required.

1.8 STAGING

A. All interior and exterior staging, required to be over eight feet in height, shall be furnished and erected by the General Contractor and maintained in safe condition by him without charge to and for the use of all trades as needed by them for proper execution of their work, except where specified to the contrary in any filed sub-bid section of the specifications.
1.9 ROOF PROTECTION
   A. None Required.

1.10 CONSTRUCTION EQUIPMENT
   A. The Contractor shall furnish and maintain all equipment such as temporary stairs, ladders, ramps, scaffolds, runways, chutes, etc., as required for the proper execution of the work, unless specifically included under the work of other trades.

   B. All such apparatus, equipment and construction shall meet all requirements of the Labor Law and other State and Local Laws applicable thereto.

1.11 DUST CONTROL
   A. The General Contractor shall provide adequate means for the purpose of preventing dust caused by construction operations throughout the period of the construction contract. The General Contractor shall clean all surfaces that, in the opinion of the Designer or UMA Project Manager, have become contaminated with dust due to construction operations.

   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.

   C. Control dust to occupied areas with negative pressure air barriers. Provide and continuously maintain dust filters on all exhaust of negative pressure fans.

1.12 NOISE CONTROL
   A. Work must be scheduled and performed in such a manner as to not interfere with the operations of the University. Construction work that is deemed by the UMA 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. 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 generators and other power equipment with mufflers.

       2. Manage vehicular traffic and scheduling to reduce noise.

1.13 ENCLOSURES
   A. Provide temporary partitions and ceiling as required to separate work areas from completed work areas, to prevent penetration of dust and moisture into finished areas, to prevent damage to existing areas and equipment.

1.14 SITE ENCLOSURE FENCE
   A. Provide enclosure fences to secure contractor staging and storage area.
B. Provide enclosure fences around dumpsters.

1.15 CLEANING DURING CONSTRUCTION

A. Unless otherwise specified under the various trade Sections of the Specifications, the General Contractor shall perform clean-up operations during construction as herein specified.

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site. 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 finishing 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 waste 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.

I. Do not burn or bury rubbish and waste materials on site.

   1. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains. Do not dispose of wastes into streams or waterways.
   2. 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 material 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 it at legal disposal area off the construction site. Remove from roof via designated route to South College loading dock.

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.

1.16 PROJECT IDENTIFICATION
1.17 FIELD OFFICES

A. The General Contractor shall provide a suitable temporary office facility within the building’s area of work area for display and use of contract documents and shop drawings and his own use. Location of the temporary office area shall be coordinated with the UMA Project Manager.

1. The Contractor’s temporary field office facility shall contain, as a minimum, plan rack, file cabinet and a reference table 3 feet x 5 feet for the storage, maintenance, and review of project specifications, drawings, shop drawings, and other submittals.

B. The location shall be coordinated with the Project Manager.

1.18 TEMPORARY SANITARY FACILITIES

A. The General Contractor shall make use of assigned toilet facilities in the building for its staff, the Resident Engineer, the Designer, and the workmen on the job, including personnel of Sub Contractors and Filed Sub Contractors.

B. The General Contractor shall take responsibility for maintenance and cleaning of assigned toilet facilities and shall leave them in first class condition equal to the accepted conditions of toilet facilities not used for construction personnel.

C. Failure of the General Contractor to properly maintain sanitary facilities shall be reason for the Owner’s withdrawal Contractor’s use of the facilities and require the Contractor’s provision of rental units.

1.19 TELEPHONE

A. The Contractor shall provide the job Superintendent with a cellular phone to allow for direct communication between the Superintendent and the UMA Project Manager and/or the UMA Resident Engineer. The Contractor may also provide additional site means telephone service required for his own use.

1. Cellular service shall be full strength signal carrier.

B. The Contractor shall pay for the installation and removal of the telephones and equipment and for calls and fixed charges in connection therewith.

1.20 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.

1.21 SHUT DOWN NOTICE

A. The Contractor shall notify the UMA 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.

1.22 CONSTRUCTION CORES

A. Prior to start of construction, the General Contractor shall review with the UMA 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 which the Contractor shall deliver to the Physical Plant for keying. The Contractor is required to return all construction core keys to the lock shop at completion of the project.

1.23 BARRICADES, WARNING SIGNS AND LIGHTS

A. Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and public of possible hazards. Where appropriate and needed, provide lighting including flashing red and amber lights.

1.24 COVERED WALKWAYS

A. None Required.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 015000
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 PRODUCTS

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 the Contract Drawings and Specifications, or within either document which is not clarified via 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 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' 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 CONTACT AND GENERAL CONDITIONS and Specifications' Sections for requirements pertaining to storage and protection of materials and equipment.

B. Store products in accordance with manufacturers' instructions, with seals and labels intact and legible. Store sensitive products in weathertight 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.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 016000
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 GLASS

A. All glass broken during the course of the work shall be replaced at the expense of the General Contractor.

1.4 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 seed mix consisting of:

- PURE SEED            GERM.
  34.72% KENTUCKY BLUE GRASS 85/80  95%
  24.68% CREEPING RED FESCUE   85%
  19.82% OMEGA III PERENNIAL RYE GRASS 95%
  19.78% SATURN PERENNIAL RYEGRASS 95%

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 infraction 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:

- **PURE SEED**
  - *34.72% KENTUCKY BLUE GRASS 85/80* 95%
  - *24.68% CREEPING RED FESCUE* 85%
  - *19.82% OMEGA III PERENNIAL RYE GRASS* 95%
  - *19.78% SATURN PERENNIAL RYEGRASS* 95%

1.5 **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.

1.6 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.

1.7 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.

1.8 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. Approved operating and maintenance (O & M) data.
3. 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 effect 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.

d. 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.

1.9 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.

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 020800 - ASBESTOS ABATEMENT

PART I - GENERAL

1.01 GENERAL PROVISIONS

   A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections
      within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this
      section of the specifications.

   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 IV of the
      CONTRACT AND GENERAL CONDITIONS.

1.02 DEFINITIONS

   A. The following definitions shall be applicable to this Section:

      “Site”: Refers to the High Rise and Low Rise buildings located at Southwest Residential
      Area at the University of Massachusetts – Amherst as described by the Contract
      Documents and Drawings.

      “Owner”: Refers to the University of Massachusetts and their designated, authorized
      personnel.

      “Architect”: Refers to Timothy Murphy Architects, 380 High Street, Holyoke,
      Massachusetts and their designated, authorized personnel.

      “Consultant”: Refers to ATC Group Services LLC (ATC), 73 William Franks Drive, West
      Springfield, Massachusetts and their designated, authorized personnel.

      “Asbestos Abatement Contractor”: Refers to the Contractor who is performing
      asbestos abatement work as outlined by this Section.

1.03 GENERAL REQUIREMENTS/QUALIFICATIONS

   A. All Asbestos Abatement work referenced herein shall be performed by a
      Massachusetts licensed Asbestos Abatement Contractor in accordance with
      Massachusetts Department of Labor and Industry (DLS) 453 CMR 6.0 Regulations.

   B. Qualifications of Asbestos Abatement Contractor

      1. Asbestos Abatement Contractor performing the abatement work of this
         section (“Asbestos Abatement Contractor”) shall be an Asbestos Abatement
         Contractor licensed to perform asbestos operations in the State of
         Massachusetts. Asbestos Abatement Contractor shall submit license number
         and proof of licensure.

      2. The Asbestos Abatement Contractor shall also provide the project name,
         contact person and phone number of three (3) projects which were
         successfully completed of similar size and scope within the last two (2) years.
         Each project shall have been completed in good standing and the work
         performed by the Asbestos Abatement Contractor for each project resulted
in no work violations/citations, contract delays, contract extensions/disputes or litigation. Failure to provide this information and/or meet the approval of these qualifications by the Owner may result in rejection of the Asbestos Abatement Contractor.

3. The Owner shall also reserve the right to research and utilized other information received from any other projects completed by the Asbestos Abatement project not provided under 1.03 B (2) above, regardless of the date completed, location or circumstances resulting from the outcome of their work. The Owner shall reserve their right to reject the Asbestos Abatement Contractor based upon this review, for any reason, if found to be in the best interest of the Owner.

NOTE: The Asbestos Abatement Contractor shall not be authorized to begin work until all credentials outlined above are reviewed and approved by the Architect.

1.04 DESCRIPTION OF WORK

A. Work: This section details all areas where asbestos abatement work is to be performed and lists areas requiring special protection during the abatement work. The Asbestos Abatement Contractor shall furnish all labor, materials, services, training, insurance, and equipment as needed to complete removal of asbestos-containing and asbestos-contaminated materials located as indicated below. The Asbestos Abatement Contractor shall follow all Federal, State and local ordinances, regulations and rules pertaining to asbestos, including its abatement, storage, transportation and disposal.

B. It shall be the Asbestos Abatement Contractor's responsibility to verify all quantity estimates in preparation of their bids, including the location and conditions of all asbestos-containing materials to be abated under this contract. No additional compensation and/or contract time shall be granted to the Asbestos Abatement Contractor for failure to perform this requirement. Full access to the site has been granted during the bidding process for this purpose.

C. The following Scope of Work and Requirements shall be applicable for asbestos abatement work at the Southwest Tower Entry Vestibules and Lowrise Lounges. If a specific note for an abatement procedure or requirement is not mentioned herein, the Asbestos Abatement Contractor shall perform the removal of such material in accordance with local, state and federal regulations. The Asbestos Abatement Contractor shall also coordinate all work with the General Contractor.

1. All Asbestos Abatement work shall take place in accordance with the provisions outlined herein as well as current local, state and federal regulations. No additional compensation shall be granted to the Asbestos Abatement Contractor for compliance with applicable laws when performing the abatement work at the site. This shall include any regulatory requirements that mandate additional or more restrictive containment and abatement procedures than what has been presented herein. It shall be the Asbestos Abatement Contractor's responsibility to comply with such regulations as well as any other additional requirements outlined by this Section.
2. The Asbestos Abatement Contractor shall be responsible for all demolition work required in order to access all asbestos materials for abatement. All demolition debris shall be disposed of as asbestos (unless otherwise directed by the Consultant).

3. Coordination shall exist between the abatement under this Section and the disconnection of existing electrical, plumbing or fire suppression equipment within the building by the General Contractor.

4. All removal procedures shall take place under full containment and a three-stage decontamination unit under negative pressure (unless otherwise approved by the Consultant).

5. With regards to the variance from requirements on polyethylene sheeting on "impervious wall" surfaces, the Asbestos Abatement Contractor shall be required to adhere to all requirements outlined by DLS regulations governing work area set-up for asbestos abatement. The Asbestos Abatement Contractor shall take full responsibility including all costs associated with approval and/or denial of such actions (i.e. non use of polyethylene) if determined to be non-compliant by the Consultant and/or a state or federal agency. If the variance is denied or discontinued by said parties; the Asbestos Abatement Contractor shall proceed with installation of polyethylene sheeting on such surfaces at no additional cost to the Owner.

6. PCB-Containing Caulking and Glazing Compound
   a. The Asbestos Abatement Contractor shall be made aware that the following materials contain asbestos and Polychlorinated Biphenyl (PCB) in excess of EPA TSCA 40 CFR 761 Regulations (>50 ppm):
      - Door and Window Glazing and Caulking (Interior and Exterior) – Balconies of Low Rise Buildings
   b. The Asbestos Abatement Contractor shall be required to remove these materials and dispose of them as asbestos and >50 ppm PCB waste. This shall include the sealants as well as the entire component (door, framework, etc.).
   c. The scope shall also include saw-cutting of the concrete and blue stone flooring at exterior door of the Vestibules. All saw-cutting shall be performed under containment and all concrete and blue stone floors within the section cut out will be disposed of as asbestos and >50 ppm PCB waste.
   d. Additionally, surface preparation will be required on the concrete or brick walls, ceilings or columns at each vestibule or balcony in order for an encapsulant (i.e. Sika Coating) to be applied to the substrates by the General Contractor and/or Filed Sub Bid Painting Contractor. The Asbestos Abatement Contractor shall refer to the Drawings and the Painting Section 09900 for specific requirements associated with preparing the surfaces to receive the Sika Coatings. Also, any wash water, brushes,
7. The following requirements shall be applicable for abatement at the Entry Vestibules of the High Rise Buildings at the site:

a. Removal shall include the entire door unit (i.e. doors, framework, sidelites, thresholds, etc.) and all interior/exterior caulking at both the exterior and interiors doors of each vestibule. This shall also include all underlying and old residual caulking present on the components, underneath the components or on adjacent substrates. All material to be disposed of as asbestos and >50 ppm PCB waste.

b. Removal shall also include the concrete slab at the front side of the exterior door and blue stone located at the inside face of the exterior door. The Asbestos Abatement Contractor shall coordinate with the General Contractor as to the limits of material to be removed. The concrete and the blue stone shall be “saw-cut” out and disposed of as asbestos and >50 ppm PCB waste.

c. The concrete walls and ceilings also have an asbestos skim coat on them which will require the following work:

- Removal of any existing electrical equipment or other components from the walls and ceilings within each vestibule as outlined by the Drawings.
- The Asbestos Abatement Contractor shall also perform any drilling or fastening required to install the new door units or other electrical equipment/component back onto the concrete walls or ceilings.
- Any loose and peeling paint or skim coat located on the concrete walls and ceiling shall also be removed to an “intact” condition. As part of the work the Asbestos Abatement Contractor shall also prepare these surfaces for application of an encapsulant (Sika Coating) by the General Contractor and/or File Sub Bid Painting Contractor. Refer to Part 1.04, C, 6, d for specific requirements.
- All removed components, material and associated debris shall be disposed of as asbestos and >50 ppm PCB waste.

d. All work including removal of the door units, saw-cutting work, and preparation of the walls and ceilings shall take place under full containment including negative pressure and a 3 stage decontamination unit.

e. It shall also be noted that a solid construction barrier (i.e. plywood with framing) will also be required to be installed to segregate the abatement work area from public occupied portions of the building at both the interior and exterior. Installation of the construction barrier shall be the responsibility of the General Contractor.

8. The following requirements shall be applicable for abatement at the Balcony Doors at the Low Rise Buildings at the site:

a. Removal shall include the entire door or window unit (i.e. doors, windows, framework, thresholds, etc.) and all interior/exterior caulking at each balcony. This shall also include all underlying and old residual...
caulking present on the components, underneath the components or on adjacent substrates.

b. Any cove base and mastic located at the interior curb underneath the doors shall also be removed.

c. Any loose or peeling paint located on concrete walls, ceiling and columns that directly abut the window framework shall also be removed to an “intact” condition. As part of the work the Asbestos Abatement Contractor shall also prepare these surfaces for application of an encapsulant (Sika Coating) by the General Contractor and/or File Sub Bid Painting Contractor. Refer to Part 1.04, C, 6, d for specific requirements.

d. All removed components, material and associated debris shall be disposed of as asbestos and >50 ppm PCB waste.

9. The following requirements shall be applicable for abatement of the adhesive/sealant on ductwork at the site:

- Removal shall include all duct pin adhesive and/or sealant material located on the ductwork to be demolished and disposed of as per the Drawings.
- This shall include all fiberglass and pin adhesive as well as all sealant material located on duct, flanges, openings, penetrations, etc. All such material shall be removed and disposed of as ACM.
- The Asbestos Abatement Contractor does have the option of cutting the ductwork apart inside containment, which will allow for the duct pieces coated with adhesive or sealant to be disposed of as ACM and all other non-coated (clean) metal to be disposed of as general construction waste.

10. Refer to Attachment A (Table 1.0) for a summary of materials that require abatement at the site. Refer to Drawings for locations of the work and coordinate all abatement with the General Contractor.

1.05 ALTERNATES
Not Applicable

1.06 SUBMITTALS

A. In addition to items required by other sections of the Project Manual, the following submittals are required for review and approval by the Architect on/or before the Pre-Construction Meeting:

1. Copy of Massachusetts DLS Asbestos Abatement Contractor’s License
2. Copies of certifications, notifications and all applicable licenses
3. Chain-Of-Command list of all personnel on-site and emergency contact person(s)
4. Work plan which dictates all removal procedures to be implemented and projected schedule of completion.
5. Name of waste hauler and proposed disposal site.
6. Copy of proposed waste shipment records, waste profiles, etc. to be used for disposal of the ACM and PCB waste.
B. In addition to the items required by other sections of the Project Manual, the following submittals are required for final payment

1. Copy of Waste Shipment Records

1.07 CODES AND STANDARDS

A. All work shall conform to the standards set by applicable Federal, State and local laws, regulations, ordinances, and guidelines in such form in which they exist at the time of the work on the contract, and as may be required by subsequent regulations. In addition to any detailed requirements of the Specification, the Asbestos Abatement Contractor shall at his own cost and expense comply with all laws, ordinances, rules and regulations of Federal, State, Regional and Local Authorities regarding handling and storing of asbestos waste material. This includes all applicable OSHA regulations.

B. All regulations and other governing agencies in their most current version are applicable throughout this project. Where there is a conflict between this Specification and the cited State, Federal, or local regulations, the more restrictive or stringent requirements shall prevail. This Section refers to many requirements found in these references, but in no way is it intended to cite or reiterate all provisions therein or elsewhere. It is the Asbestos Abatement Contractor's responsibility to know, understand, and abide by all such regulations and common practices.

1.08 FEES, PERMITS & LICENSES

A. The Asbestos Abatement Contractor shall pay all licensing fees, royalties, and other costs necessary for the use of any copyrighted or patented product, design, invention, or process in the performance of the work specified in this section. The Asbestos Abatement Contractor shall be solely responsible for costs, damages, or losses resulting from any infringement of these patent rights or copyrights. The Asbestos Abatement Contractor shall hold the Owner, Owner's Representative/General Contractor, Consultant and Architect harmless from any costs, damages, and losses resulting from any infringement of these patent rights or copyrights. If the Contract Specification requests the use of any product, design, invention, or process that requires a licensing, patent or royalty fee for use in the performance of the job, the Asbestos Abatement Contractor shall be responsible for the fee or royalty fee and shall disclose the existence of such rights.

B. Asbestos Abatement Contractor shall be responsible for costs for all licensing requirements, where applicable and notification requirements and all other fees related to the Asbestos Abatement Contractors ability to perform the work in this Section.

C. Secure all necessary permits for work under this Section, including hauling, removal, and disposal, fire, and materials usage, or any other permits required to perform the specified work.
1.09 CLEANING

A. Maintain the work site in a neat and orderly manner at all times, so as not to interrupt or infringe upon the work of other trades. Perform all final cleaning of abatement work areas as required by this Section and Massachusetts Regulations to the approval of the Owner’s Consultant. Upon completion of work in any given area, Asbestos Abatement Contractor shall remove all material and equipment associated with the work, not necessary to complete other phases of the work in that area.

B. Comply with all requirements for final clearance and release of a work area as described in this Section and required by the Massachusetts Regulations prior to take down of polyethylene and area clean-up.

1.10 COORDINATION

A. Extend full cooperation to Owner in all matters involving the use of Owner’s facilities. At no time shall the Asbestos Abatement Contractor cause or allow to be caused conditions, which may cause risk or hazard to the general public, or conditions that might impair safe use of the facility.

B. Coordinate the work of this section with that of all other trades as directed by the General Contractor and at the express consent of the Owner and Architect. Phasing and scheduling of this project will be subject to the approval of the Owner and Architect. The work of this Section shall be scheduled and performed so as not to impede the progress of the project as a whole. Work shall not proceed in any area without the express consent of the Owner and Architect. The Asbestos Abatement Contractor shall be available within 24 hours notice for additional work if after acceptance of the work it is found that full abatement was not achieved from the initial work effort as determined by the Owner, Architect or Consultant.

C. Complete Asbestos activities in the phases of the final schedule agreed upon by Owner, Architect and General Contractor.

1.11 SUBSTITUTION OF MATERIALS OR METHODS

A. Owner and Architect approval is required for all modifications to methods, procedures, and design, which may be proposed by the Asbestos Abatement Contractor. It is the intent of these documents to allow the Asbestos Abatement Contractor to present alternative methods to the abatement processes herein, for review by Owner and Architect. Any such modifications or substitutions to methods, procedures, or design shall comply with applicable regulations. Asbestos Abatement Contractor shall submit the proposed modification or substitution in accordance with the requirements of the General Conditions, and no later than fifteen (15) working days prior to planned commencement of proposed modification, for review and approval.

B. Unless requests for modification or substitution are made in accordance with the above instructions and the instruction of the General Conditions, supported by sufficient proof of equality, Asbestos Abatement Contractor shall be required to furnish the specifically named or designed items, methods or procedures designated in this Section.
C. If the modification or substitution necessitates changes or additional work, same shall be provided and the Asbestos Abatement Contractor shall assume the cost and the entire responsibility thereto unless performed under the approved Change Order Process.

D. The Owner and Architect's permission to make such substitution shall not relieve the Asbestos Abatement Contractor from full responsibility for the work.

1.12 SITE SECURITY

A. The Asbestos Abatement Contractor is responsible for performing all work under this contract without contaminating the building environment with asbestos fibers. This includes interiors of duct work, outside containment locations, machinery and equipment and any other release into unregulated spaces. The Asbestos Abatement Contractor is responsible for making right and clean-up of any such contamination if found to be present.

B. The Asbestos Abatement Contractor will be responsible for the security of the abatement area, allowing only authorized personnel into the area, and securing assigned entrances and exits with locked doorways at the end of the work day. Signs will be posted prior to asbestos removal as required in 29 CFR 1926.1101.

1.13 PROJECT MONITOR

A. The Owner (through the Architect) has retained ATC Group Services LLC (ATC) as their Consultant for technical advisement and project management during the asbestos removal portion of the Project. ATC will perform on-site asbestos project monitoring services during all phases of asbestos removal. The Asbestos Abatement Contractor shall regard ATC’s direction, as authoritative and binding as provided herein, in matters outlined by this Section. However, all work shall be subject to final approval by the Architect and the Owner.

B. ATC’s licensed Project Monitor will perform monitoring of Asbestos Abatement Contractor’s work practices and performance, inspection of the worksites, and air sampling and analysis for each phase of the asbestos removal project. Quality control and testing criteria has been established in these specifications, and will be strictly enforced.

1.14 TEMPORARY FACILITIES

A. Use of Owner provided facilities is specified in Division 1 and shall be coordinated through the Owner and General Contractor

PART II - PRODUCTS

2.01 MATERIALS

A. All materials and equipment proposed to be used on this project shall be subject to the acceptance of the Architect and Consultant. The Asbestos Abatement Contractor shall comply with local, state and federal regulations pertaining to the selection and use of materials and equipment on this project. The Asbestos Abatement Contractor shall provide a submittal on all materials and equipment to be used for review and approval by the Architect and Consultant prior to commencement of the work.
PART III - EXECUTION

3.01 PREPARATION

A. Critical Barriers: Prior to any masking and sealing operations which will make up the asbestos removal work area, windows, doors, openings, ducts, drains and vents will be masked and sealed with a minimum of one layer of six (6) mil polyethylene sheeting. Large opening to occupied areas, such as open doorways, hallways, passageways and major openings shall be sealed with permanent, solid construction materials and made air tight in accordance with DLS regulations 453 CMR 6.00. Voids in the walls and ceilings that are due to penetrations of conduits and pipes shall be sealed with fire retardant spray foam. Exposed electrical panels in work areas will be shut off when possible, and masked and sealed with a minimum of two (2) layers of six (6) mil polyethylene and duct tape.

B. Decontamination Chambers: It is the Asbestos Abatement Contractor's responsibility to provide Decontamination Chambers consisting of an equipment room, shower and clean room for personnel involved in asbestos removal. The Chamber shall be masked and sealed with two layers of six mil polyethylene sheeting with flaps between each room. Each of the three rooms will be of a sufficient size to accommodate the Asbestos Abatement Contractor's contaminated personnel and related equipment. The rooms will be framed, masked, sealed and attached and sealed to the entry/exit ways of asbestos worksites. Adequate heat and light will be safely provided. The Asbestos Abatement Contractor shall provide a minimum of one water heater per work area decontamination chamber. Waste water will be filtered by 20 micron and 5 micron filters in series prior to discharge.

3.02 ABATEMENT PROCEDURES

A. General: The following paragraphs detail the work requirements for the regulated area. Workers shall wear tyvek suits and respiratory protection for all removals.

B. Masking and Sealing

1. Critical Barriers

   a. Prior to any masking and sealing operations which will make up the asbestos removal work area, windows, doors, openings, ducts, drains and vents will be masked and sealed with a minimum of one layer of six (6) mil polyethylene sheeting. Voids in the walls and ceilings that are due to penetrations of conduits and pipes shall be sealed with fire retardant spray foam. Large opening to occupied areas, such as open doorways, hallways, passageways and major openings shall be sealed with permanent, solid construction materials and made air tight in accordance with DLS regulations 453 CMR 6.00.
b. In areas where drains or sump pumps are located, primary filters will be placed in drain and openings sealed with 6 mil polyethylene sheeting, in addition to floor masking and sealing requirements.

c. Any furniture, fixtures, or stored material that cannot be removed or that must remain in the work area will be covered, masked and sealed with a minimum of one layer of six (6) mil polyethylene sheeting. If the surfaces of these materials are determined to be contaminated with asbestos fibers, the Contractor shall remedial clean them prior to masking and sealing.

d. Exposed electrical panels in work areas will be shut off when possible, and masked and sealed with a minimum of two (2) layers of six (6) mil polyethylene and duct tape.

2. Full Containment:

a. Unless otherwise specified, floors and walls will be masked and sealed with two layers of six mil polyethylene sheeting with a minimum overlap of two feet at seams and up walls. Where it is necessary to mask and seal ceiling areas, a minimum of two layers of four (4) mil polyethylene sheeting will be used.

b. The floors shall be covered first and the flooring plastic shall extend up on the walls. The walls shall then be covered with plastic from ceiling to floor level, thus overlapping the floor plastic. The floor shall then be covered with the second layer of plastic, the plastic extended up the walls and the edges sealed to the wall plastic. The walls shall then be covered with a second layer of plastic from ceiling to floor level, thus overlapping the second layer of floor plastic. The bottom portion of the wall plastic shall thus be sandwiched between the layers of the floor plastic. If the floor or wall plastic necessitates seams, the seams in successive layers of plastic sheet shall be staggered so as to reduce the potential for water or asbestos to penetrate through the covering.

c. The two separate layers of six-mil polyethylene sheeting on walls and floors shall constitute the primary and secondary containment barriers, respectively. This containment, along with the decontamination chamber, will constitute full containment, and will isolate the contained worksite from surrounding areas except where air must enter the worksite due to the use of exhaust equipment.

3. Mini-Containment:

a. Unless otherwise specified, floors and walls will be masked and sealed with a minimum of one layer of six mil polyethylene sheeting with a minimum overlap of 12 inches at seams and up walls. No seams shall be located at the wall-to-floor joints.

b. Where it is necessary to mask and seal ceiling areas, a minimum of two layers four (4) mil polyethylene sheeting will be used.
c. A single stage decontamination unit shall be erected at the entrance to the mini-containment.

C. Personal Air Sampling: Daily personal and excursion sampling will be the responsibility of the Contractor to check personal exposure levels versus respiratory protection and to check work practices. At least 25% of the workers in each shift, but not less than 2, shall be sampled. The Contractor is responsible for his own personal sampling as outlined in OSHA Regulation 1926.1101. The Contractor shall post the personal air sample results within 24 hours.

D. Remedial Cleaning: Remedial cleaning of horizontal surfaces, ledges, and equipment will be required prior to masking and sealing operations of work areas. Cleaning will be done using HEPA vacuums and wet methods. Determinations of additional remedial cleaning will be made on the basis of hazard potential to workers and the outside environment relating to setup and masking and sealing operations (as deemed by the Consultant). Respiratory protection and protective clothing will be required for the cleaning. Prior to remedial cleaning negative air filtration units and a three stage decontamination shall be in place and running and all wall and ceiling penetrations shall be sealed with fire retardant spray foam.

E. Decontamination Chambers: The Contractor shall construct a decontamination chamber in accordance with local, state and federal regulations governing asbestos abatement.

F. Negative Air Filtration: The Contractor shall establish negative pressure air filtration within the work areas. The Contractor shall install, operate, and maintain a sufficient number of Negative Air Filtration Units (NAFU's) to meet the requirements of local, state and federal regulations.

G. Removals: Removal of asbestos containing materials, unless specified otherwise, will be performed using negative air filtration techniques, wet methods, attached three stage decontamination chambers, the masking and sealing of openings, ducts and vents, full two-layer plastic containment’s and the encapsulation of post removal surfaces. Removals will be as indicated and as specified herein, and will be performed in a neat and workman like manner to the limits indicated or specified. Asbestos will be consistently and thoroughly wetted with a fine spray of amended water and will be carefully removed and immediately placed in approved and properly labeled six mil polyethylene disposal bags. Asbestos residual materials will be diligently scraped or brushed from surfaces. After brushing and scraping, surfaces will be free of visible debris and fibers and surfaces will be HEPA vacuumed clean.

H. Visual Inspections: Work areas shall pass a visual inspection conducted by the Site Supervisor responsible for the project and the Owner's Project Monitor (i.e. Consultant). The criterion for this inspection will be the absence of visible debris in accordance with ASTM standard E1368-90. A certificate of visual inspection will be signed by the Project Monitor and the Site Supervisor after final inspection clearance. The Contractor will be responsible for the costs of visual inspection and testing required for any work which fails clearance air quality criteria.

I. Encapsulation: A bridging encapsulant/lockdown sealant will be applied to remaining surfaces in direct contact with removal operations, polyethylene
sheeting and on any porous surfaces within the work site. The chosen encapsulant must be compatible with the replacement materials and conform to the proper edition of applicable fire and electrical standards.

J. Work Completion: Final air clearance testing for asbestos shall be performed by the Owner’s Project Monitor for all areas.

3.03 DISPOSAL

I. ASBESTOS MATERIALS

A. Packaging: Prior to post-abatement inspection, asbestos-containing waste material (ACWM) shall be packaged in sealed double containers and removed from the work area to a specified transportation vehicle or a designated holding area approved by the Owner. At the end of each work day the Asbestos Abatement Contractor shall remove the debris accumulated during that day’s work activities using procedures outlined in the Specifications. The Asbestos Abatement Contractor shall provide a daily tally of all bags removed.

B. Temporary Storage of Waste: An area for temporary storage of ACWM must be approved by the Owner. ACWM must be stored in a restricted area and must be in an enclosed container which is posted and secured whenever not in use. ACWM shall NOT be stored outside the building on the ground, pavement areas or other non-enclosed area. ACWM waste material shall be loaded into a waste transportation vehicle/dumpster and hauled away as soon as there is a sufficient quantity available for direct transportation to the approved disposal site. ACWM waste shall NOT be transferred back to the Asbestos Abatement Contractor’s yard/facility unless approved by the Owner. ACWM shall only be stored at:

1. An approved refuse transfer station facility permitted or that is managing such wastes in accordance with 310 CMR 19.061 and/or;
2. The site of generation of the asbestos abatement activity.

Note: All ACWM shall be shipped from the site for disposal within 30 days after completion of the work and acceptance of a final visual inspection by the Consultant.

C. OSHA/EPA labeling: Asbestos warning labels having permanent adhesive and waterproof print, or being permanently printed on the container, shall be affixed to the outside of all asbestos containers, and each inside bag. Labels will be conspicuous and legible and shall contain the following warning:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATH DUST
AVOID CREATING DUST
The Asbestos Abatement Contractor is directed to properly label each waste bag in accordance with the latest NESHAP standard, Section 61.150, with the following information:

SITE OWNER'S NAME
SITE NAME

D. DOT labeling and marking: A DOT "class 9" shipping label and DOT mark shall be applied to or be printed on each packaging of ACWM.

E. Waste Transportation: All ACWM waste shall be containerized pursuant to 310 CMR 7.15 prior to being transported. All ACWM waste shall be transported in totally enclosed vehicles or containers that are designed, constructed, and operated to prevent spills, leaks or emissions. All ACWM waste shall be transported in compliance with 40 CFR Part 61 and applicable Department of Transportation (DOT), OSHA and local regulations. Each vehicle transporting asbestos-containing waste shall be marked with asbestos danger signs during loading and unloading of the waste, in accordance with the NESHAP, 40 CFR 61.150.

F. Asbestos waste shipment records: The Asbestos Abatement Contractor shall prepare the waste shipment records for disposal of the ACWM. All ACWM waste to be disposed of from the site shall be shipped on "Asbestos Waste Shipment Record" that meets the requirements of MADEP 310 CMR 7.15 (18) Regulations. A copy of the Waste Shipment Record to be used shall be provided to the Owner for review and approval. A representative from the Owner shall sign-off as “Generator” on the Asbestos Waste Shipment Record for each shipment leaving the site.

G. The following information shall be included on the waste shipment record for each and every load of ACM transported off-site:

1. The name, address and telephone number of the owner/operator of the facility or dumping ground where asbestos abatement activities have occurred;
2. The quantity and type (friable or non-friable) of the ACWM in cubic meters (cubic yards) and a description of the container used for shipment;
3. The name, address and telephone number of the person who conducted any asbestos abatement activity;
4. The name and telephone number of the disposal site operator;
5. The name and physical location of the disposal site;
6. The date transported;
7. The name, address, and telephone number of the transporter(s);
8. Certification by the owner/operator of the facility or dumping ground where asbestos abatement activities have occurred/where asbestos waste was generated that the contents of each shipment have been characterized, packaged, marked and labeled in accordance with 310 CMR 7.15;
9. Signature of each transporter confirming the contents of each shipment are in all respects in the proper condition for transport according to applicable international, federal, state and local regulations;
10. Signature by the receiving disposal facility confirming that: i) the quantity of ACWM listed on the waste shipment record is the same as the quantity accepted for disposal; and ii) it holds appropriate permits and/or authorizations to accept for disposal ACWM described on waste shipment records.

**Note:** The final waste shipment records (with signature of acceptance at the landfill) for disposal of ACM from the project site shall be received by the Owner within 35 days of shipment from the site.

II. **ASBESTOS & PCB MATERIALS**

A. All costs associated with removal and proper disposal of the asbestos and PCB materials associated with the work of this Section shall be the responsibility of the Asbestos Abatement Contractor under the Contract. All materials shall be disposed of in accordance with all laws, and the provisions of this Section and any or all other applicable federal, state, county or local regulations and guidelines.

B. All testing required by the waste transporter and/or disposal facility to profile the material for acceptance shall be the responsibility of the Asbestos Abatement Contractor. All costs associated with sample collection, analysis and interpretation of the results shall be borne by the Asbestos Abatement Contractor under the Contract. All analytical results shall be provided to the Consultant for review and approval.

C. **NO WASTE SHALL LEAVE THE SITE UNLESS AUTHORIZED BY THE OWNER.**

D. Types of waste that will be generated during this remediation include, but are not limited to:

1) Caulking and glazing compound
2) Door and window units, framework, glass, etc.
3) Concrete, stone and associated materials
4) Skim coat material from concrete walls and ceilings and associated equipment and materials
5) Tools, equipment, PPE and containment materials.
6) Waste Water and contaminated materials from abatement and surface preparation activities.

C. Asbestos and PCB Waste $\geq 50$ parts per million (ppm):

1. All components removed and associated materials generated on this project shall be containerized and labeled as asbestos and $>50$ ppm PCB Waste for disposal as hazardous waste.
2. Rags, mops, sponges, liquid, etc., PPE and containment materials (i.e., poly, tape, etc.) shall also be containerized and labeled as asbestos and $>50$ ppm PCB waste for disposal as hazardous waste.
3. Waste items shall be disposed of in accordance with 40 CFR 761 at a licensed facility that will receive and retain asbestos and $>50$ PPM PCB Waste.
Note: The proposed waste disposal sites and Waste Profile to be used on this project shall be provided to the Owner for review and approval. The Owner reserves the right to approve or reject any proposed facility if it is found to be in the best interest of the Owner. If a site is rejected by the Owner, the Asbestos Abatement Contractor shall not be compensated for any costs for changing waste disposal sites.

D. All waste containers shall be placed in a designated storage area on site that is secured and within a chained link fence that is locked. Any drums, Gaylord boxes, etc. shall be placed inside an enclosed trailer or other storage container that is locked. The storage area will be placarded as containing PCB Waste with markings meeting the EPA requirements of 40 CFR 761.40 and 761.45.

Note: As part of the Contract, PCB waste that is containerized shall be shipped from the site within 30 days from the start date of filling that specific dumpster, drum or trailer.

E. Waste container(s) shall be stored in accordance with 761.65(c) and labeled in accordance with CFR 761.40. All roll-off containers shall be placed in a designated storage area on-site that is secured within a chained-link fenced that is locked. The storage area will be placarded as containing asbestos as well as PCB Waste with markings meeting the EPA requirements of 40 CFR 761.40 and 761.45. Additionally, all roll-offs shall be closed-top to prevent any water from infiltrating the container and be lined with two (2) layers of six 6 mil polyethylene sheeting. All drums used to contain liquid waste (mops, cloths, etc.) shall be stored within a closed top container that is locked and secured. Storage of drums within the building or on the exterior ground will not be permitted.

F. Manifests: A Waste Manifest is required for the removal from the premises, and disposal of all items included in this Section. The Asbestos Abatement Contractor shall be required to complete the waste profile for the site and provide a copy to the Owner for review and approval prior to the start of the project.

- Each manifest, bill of lading, or other applicable documentation, shall note the truck registration number, state of registration, name of driver, and date of removal of material from the site.
- The Asbestos Abatement Contractor shall comply with the RCRA Hazardous Waste Manifest policies and is responsible for utilizing the Owners EPA Identification Number for the site.
- The EPA Identification Number shall be used for all hazardous waste management associated with this Site.
- The Owner will be designated as generator and will sign all manifests and waste profile applications or questionnaires.

Note: The Asbestos Abatement Contractor shall notify the Owner at least 48 hour in advance to shipment of waste from the site.
3.04 QUALITY CONTROL AND TESTING

A. The Asbestos Abatement Contractor shall be responsible for achieving acceptable visual and final air clearance testing for ALL abatement areas as follows:

- Clearance inspection: ATC’s Project Monitor shall inspect the work area and surrounding areas for clearance using visual and physical methods, prior to clearing the project for air monitoring clearance procedures.

- Post-abatement Clearance Air Monitoring: For each abatement areas, post abatement clearance air samples will be taken when a visual inspection by ATC’s Project Monitor detects no visible debris, and surfaces are encapsulated and dry.

- Based upon the quantity of material to be abated, either Phase Contrast Microscopy (PCM) or Transmission Electron Microscopy (TEM) clearance testing will be performed to confirm the completion of removal. All clearance testing shall be performed in accordance with state of Massachusetts and EPA “Asbestos Hazard Emergency Response Act” (AHERA) Regulations. The work areas shall be considered complete if the following criteria is met:

1. Containment’s cleared and samples analyzed by Phase Contrast Microscopy (PCM): Maximum airborne fiber concentration of <0.01 fibers per cubic centimeter (minimum 5 samples).

2. Containment’s cleared and samples analyzed by Transmission Electron Microscopy (TEM): The average concentration of asbestos on the five inside containment samples in not statistically different (as determined by the Z-test calculation found in Appendix A of 40 CFR 763 Subpart E) from the average asbestos concentrations of the five outside containment samples, and average asbestos concentrations of the three field blanks are below the filter background level of 70 structures per square millimeter (70/smm).

Note: If the visual inspection fails, the Asbestos Abatement Contractor shall reclean the entire work at no additional cost to Owner, utilizing the methods specified in this section. The Asbestos Abatement Contractor shall pay for all additional testing and inspections until the clearance level is achieved as per this Section. The cost of additional testing and inspection shall be paid by the Asbestos Abatement Contractor by subtracting the cost for analysis and inspector’s time from the Contract total. This shall also include resampling of any areas where air cassettes became overloaded due to construction activities.
ATTACHMENT A

TABLE 1.0
SUMMARY OF MATERIALS TO BE ABATED
<table>
<thead>
<tr>
<th>NO.</th>
<th>LOCATION</th>
<th>MATERIAL</th>
<th>QUANTITY</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Rise Buildings</td>
<td>Duct Sealant/Pin Adhesive</td>
<td>10 EA</td>
<td>On AHU units in the Basement Underneath the Vestibules. 2 locations per Building. Includes all ductwork to be removed as per the Drawings.</td>
</tr>
<tr>
<td>2</td>
<td>High Rise Buildings</td>
<td>Pipe Fittings on Fiberglass Lines</td>
<td>100 EA</td>
<td>Includes removal of the ACM pipe fittings which will be disturbed from new work. Asbestos Contractor to coordinate with the GC for specific locations at each building</td>
</tr>
<tr>
<td>3</td>
<td>High Rise Buildings</td>
<td>Entry Doors at Vestibules</td>
<td>Refer to Drawings</td>
<td>Includes both the interior and exterior doors, frames, sidelites, sealants, etc. of vestibules as well as concrete and stone flooring</td>
</tr>
<tr>
<td>4</td>
<td>High Rise Buildings</td>
<td>Skim Coat on Concrete or brick Walls and Concrete Ceilings</td>
<td>Refer to Drawings</td>
<td>Includes removal of existing components, installation of new components, removal of loose skim coat and surface preparation.</td>
</tr>
<tr>
<td>5</td>
<td>Low Rise Lounges</td>
<td>Door &amp; Window Units</td>
<td>Refer to Drawings</td>
<td>Includes removal of the doors/windows and framework, sealants, cove base/mastic, loose skim coat and surface preparation.</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 020810 - DISTURBANCE OF LEAD, CADMIUM & CHROMIUM MATERIALS

PART I - GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

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 IV of the CONTRACT AND GENERAL CONDITIONS.

1.02 DEFINITIONS

A. The following definitions shall be applicable to this Section:

“Site”: Refers to the High Rise and Low Rise buildings located at Southwest Residential Area at the University of Massachusetts – Amherst as described by the Contract Documents and Drawings.

“Owner”: Refers to the University of Massachusetts and their designated, authorized personnel.

“Architect”: Refers to Timothy Murphy Architects, 380 High Street, Holyoke, Massachusetts and their designated, authorized personnel.

“Consultant”: Refers to ATC Group Services, LLC (ATC), 73 William Franks Drive, West Springfield, Massachusetts and their designated, authorized personnel.

“Contractor”: Refers to the General Contractor and all Subcontractors who are performing construction work outlined by the Contract Documents. Contractor as referenced, applies to ALL trades (including Field Subcontractors) working at the site.

1.03 DESCRIPTION OF WORK

A. The Contractor shall be made aware that lead, cadmium and chromium is present within painted substrates or within building components throughout the site which will be impacted by renovation activities on this project.

B. The Contractor shall be required to comply with all aspects of the Occupational Safety and Health Administration (OSHA) Regulations pertaining to lead, cadmium and chromium with regards to disturbance of these materials when performing their work.

C. It shall be the sole responsibility of the Contractor for compliance with this Section, including all costs associated with, but not limited to:

- Compliance with OSHA 29 CFR 1926.62 Lead Regulations.
- Compliance with OSHA 29 CFR 1926.1127 Cadmium Regulations.
- Compliance with OSHA 29 CFR 1926.1126 Chromium Regulations.
- Development and implementation of a Compliance Program.
• Development and implementation of a Respiratory Program.
• Development and implementation of a Medical Monitoring Program.
• Development and implementation of a Hazard Communication Program.
• Performance of any lead, cadmium or chromium testing required on the project.
• Performance of any Negative Exposure Assessments required.
• Providing all medical examinations required.
• Providing all equipment required (Including appropriate PPE)
• Providing all engineering controls and associated work practices.
• Disposing of all demolition material in accordance with local, state and federal regulations

D. It should be noted that abatement of lead paint by a licensed Abatement Contractor shall not be required as per Massachusetts Department of Public Health (DPH) “Child Lead Poisoning and Prevention Regulations. However, for work under this Contract, each Contractor performing renovation work at the site shall be certified in accordance with the Environmental Protection Agency (EPA) 40 CFR Part 745 Regulations – “Renovation, Repair and Painting Rule” and shall adhere to all requirements specified under the regulation.

E. If the Contractor deems that removal of the lead, cadmium or chromium paint will be an appropriate "engineering control" for compliance with their OSHA programs, then such removal shall be performed at the Contractor's own expense in accordance with applicable requirements. No additional compensation shall be granted for any engineering control methods employed by the Contractor for compliance with this Section, OSHA or other applicable requirements. In addition, all costs associated with removal of paint to meet compliance with applicable construction standards (i.e. welding, torch cutting, grinding, etc.) shall be the responsibility of the Contractor under the Base Bid.

F. Due to the age of the buildings and previous painting history, the Contractor shall assume all painted surfaces to contain lead, cadmium and chromium and comply with this Section and OSHA Regulations accordingly. In addition, building components such as piping, sleeves, conduit, electrical equipment, etc. may also contain lead, cadmium or chromium that will require compliance accordingly. The Contractor, at their own discretion may elect to perform testing to confirm the presence of lead, cadmium and chromium in the building. However, all costs associated with additional testing and compliance with this Section shall be borne by the Contractor under the Base Bid.

G. OSHA regulates activities that disturb the lead, cadmium and chromium by the use of manual techniques. Regulated activities include abrasive blasting, welding, and cutting, burning on structures, manual scraping or sanding, and manual demolition of structures or components. The work practices described in this Section are intended to adequately protect the workers from exposure to lead, cadmium and chromium, provide a safe workplace, and protect the environment. However, it shall be the Contractors responsibility to comply with this Section as well as any other provisions/requirements outlined by OSHA and other applicable regulations.

H. Materials and Equipment: The work of this Section, without limiting the generality thereof, includes the furnishing of labor, materials, tools, equipment, services and incidentals necessary to safely accomplish tasks which will disturb lead, cadmium and chromium.
I. Approvals and Inspections: Temporary facilities, work procedures, equipment, materials, services, and agreements must fully comply with EPA, OSHA, and NIOSH recommendations, standards and guidelines, as well as any other applicable federal, state, and local regulations. Where there exists an overlap of these regulations and guidelines, the most stringent shall apply.

J. Disposal: The Contractor shall dispose of demolition debris and associated materials in accordance with Part 3.06 of this Section.

1.04 SITE WORK DEFINITIONS

A. Action Level: Action Level as defined by OSHA shall refer to employee exposure, without regard to the use of respirators, to an airborne concentration of lead, cadmium or chromium calculated as an 8-hour time-weighted average (TWA).

B. Competent Person: Competent Person shall refer to a person who is capable of identifying existing and predictable hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.

C. HEPA Filter: HEPA Filter shall refer to a filter capable of filtering out monodispersive particles of 0.3 microns or greater diameter from a body of air at 99.97 percent efficiency or greater.

D. Lead, Cadmium and Chromium Paint: Shall refer to paint found to contain lead, cadmium and chromium in any concentration or paint assumed to contain lead, cadmium and chromium as indicated in this Section.

E. Permissible Exposure Limit (PEL): PEL shall refer to employee exposure, without regard to the use of respirators, to an airborne concentration of lead, cadmium or chromium calculated as an 8 hour time-weighted average.

1.05 PERMITS AND INSPECTIONS

A. Notifications/Approvals: The Contractor shall make, in proper and timely fashion, any necessary notifications to relevant Federal, State, and local authorities and shall obtain and comply with the provisions of all permits or applications required by the work specified, as well as make all required submittals required under those auspices. The Contractor shall indemnify the Owner, their representatives and agents from, and pay for claims resulting from failure to adhere to these provisions. The costs for permits, applications, and the like, are to be assumed by the Contractor.

B. Fees, Permits and Licenses: The Contractor shall pay licensing fees, royalties, and other costs necessary for the use of any copyrighted or patented product, design, invention, or processing the performance of the job specified in this Section. The Contractor shall be solely responsible for costs, damages or losses resulting from any infringement of these patent rights or copyrights. The Contractor shall hold the Owner and Consultant harmless from any costs, damages, and losses resulting from any infringement of these patent rights or copyrights. If the Specification requests the use of any product, design, invention, or process that requires a licensing fee or royalty fee for use in the performance of the job, the Contractor shall be responsible for the fee or royalty and shall disclose the existence of such rights.

C. Contractor shall be responsible for costs for licensing requirements and notification
requirements and other fees related to the ability to perform the work in this Section. The Contractor shall be responsible for securing necessary permits for work under this Section, including removal, materials usage, or any other permits required to perform the specified work.

1.06 SUBMITTALS

A. Pre-Construction Submittals: Prior to the commencement of the required work, the Contractor shall provide the following to the Architect for approval:

- A written description detailing the means and methods to achieve compliance with the OSHA standards, RRP regulations and the provisions outlined herein.
- A written description detailing the means and methods for properly disposing of all demolition debris in accordance with local, state and federal regulations.

B. Post-Construction Submittals: Final payment to the Contractor shall not be made unless the following items are submitted to the Architect for approval:

- Original Copy of Waste Disposal Manifests acknowledging disposal of any hazardous and non-hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative.

1.07 QUALITY CONTROL/ASSURANCE

A. Training Requirements: Workers who will have the potential of lead, cadmium and chromium exposure shall have proof of successfully completing a training course which covers the topics required by OSHA. Contractors are also advised that training in other areas may be required by OSHA and are responsible to ensure that all training requirements for appropriate trades and procedures are met.

B. Specified Supervisor Qualifications: The Contractor shall specify an on-site Supervisor or Competent Person who is fully qualified in all aspects of safe work practices and procedures, and have (or will have) completed a training course within the previous year prior to the commencement of the work. The training course will cover all topics required by OSHA as well as training in relevant federal, state and local regulatory requirements, procedures and standards, supervisory techniques, and proper disposal procedures.

C. Site Specific Written Compliance Program: The program will be evaluated to ensure the elements required by OSHA are specific to the conditions at the job site.

D. Respiratory Protection Program: The Contractor must provide for review a written respiratory protection program in accordance with 29 CFR 1920.103 if respiratory protection is to be worn during this project.

E. Fit Test Records: If respiratory protection is to be worn as part of this project, records of successful respirator fit testing performed by a qualified individual within the previous 12 months, for each employee to be used on this project with the employee’s name and social security number with each record.
F. Medical Surveillance: The Contractor shall provide biological monitoring to workers who have the potential of lead, cadmium and chromium exposure. This monitoring shall be performed in accordance with OSHA. If workers are expected to exceed the action level for more than 30 days in any consecutive 12 months the Contractor shall institute a medical surveillance program in accordance with OSHA. A laboratory approved by OSHA shall conduct Blood level sampling and analysis.

1.08 CODES AND STANDARDS

A. Work shall conform to the standards set by applicable federal, state and local laws, regulations, ordinances, and guidelines in such form in which they exist at the time of the work on the contract and as may be required by subsequent regulations.

B. In addition to any detailed requirements of the Specification, the Contractor shall at his own cost and expense comply with all laws, ordinances, rules and regulations of federal, state, regional and local authorities regarding handling and storing of waste material.

NOTE: Regulations by the above and other governing agencies in their most current version are applicable throughout this project. Where there is a conflict between this Specification and the cited federal, state or local regulations or guidelines, the more restrictive or stringent requirements shall prevail. This Section refers to many requirements found in these references, but in no way is it intended to cite or reiterate all provisions therein or elsewhere. It is the Contractor's responsibility to know, understand, and abide by all such regulations, guidelines and common practices.

PART 2.0 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. The Contractor shall be responsible for providing all material and protective equipment required for performance of the work. The Contractor shall comply with all local, state and federal regulations pertaining to the selection and use of materials and equipment on this project. The Contractor shall provide a submittal on all materials and equipment to be used for review and approval by the Architect.

PART 3.0 - EXECUTION

3.01 WORKER PROTECTION

A. Initial Determination: The Contractor shall determine, through personal exposure monitoring on the job site or through relevant documentation from other similar jobs, whether workers will be exposed to airborne lead, cadmium or chromium at or above the OSHA Action Level and Permissible Exposure Limit. If exposures at or above the action level are documented, appropriate health and safety procedures identified herein shall be followed. If levels below the action level are documented, the Contractor shall exercise an appropriate level of care to ensure that exposures above the action level do not occur. Whenever there is a chance of equipment, process, control, personnel or a new task has been initiated that may result in additional employees being exposed to airborne lead, cadmium or chromium at or at or above the action level or may result in employees already exposed at or above the action level being exposed above the PEL, the Contractor shall conduct additional monitoring.
Note: The Contractor shall be responsible for performing a negative exposure assessment on each trade subject to the OSHA Regulation. The assessment shall take place during routine work activities, which will simulate employees, actual exposure levels to lead, cadmium and chromium. All assessments shall take place over an 8-hour time period and shall include all appropriate PPE and biological monitoring required as stated herein.

B. Personal Hygiene Practices: Where exposures to airborne lead, cadmium and chromium above the OSHA PEL occurs or may be expected to occur, the Contractor shall enforce and follow good personal hygiene practices. These practices shall be performed until personal exposure sampling indicates that exposures are below the PEL at which time the Contractor has the option to continue or discontinue the use of personal hygiene facilities. These practices shall include but not be limited to the following:

1. No eating, drinking, smoking or applying of cosmetics in work area. The Contractor will provide a clean space, separated from the work area, for these activities.

2. Workers must wash upon leaving the work area. The Contractor will provide wash facilities. This wash facility will consist of, at least, running potable water, towels, and a HEPA vacuum. Upon leaving the work area, each worker will remove and dispose of work suit, wash and dry face and hands, and vacuum clothes.

3. Disposable clothing, such as TYVEK suits, and other personal protective equipment (PPE) must be donned prior to entering work area. A clean room will be provided for workers to put on suits and other personal protective equipment and to store their street clothes. Disposable suits shall be used once, then properly discarded.

4. A lavatory facility must be provided and located adjacent to the work area. The eating and drinking area, clean room, and the lavatory facility must be maintained in a clean and orderly fashion at all times. The Contractor will provide portable lavatories when needed and disinfect them daily.

5. If air-monitoring data gathered by the Contractor shows that employees’ exposure to airborne lead, cadmium or chromium exceeds the PEL, the following conditions apply:
   a. Showers must be provided. Shower water must pass through at least a 5.0 micron filter before returning to the public waste system.
   b. Workers must shower upon leaving work area.
   c. Three-stage decontamination unit must be established consisting of an Equipment Room, Shower, and Clean Room in series.

3.02 WORK AREA SET UP

A. Site Safety: The Contractor is responsible for all safety at the work site. This includes, but is not limited to, electrical safety, mechanical (tool) safety, fire safety, and personnel protective safety. Safety requirements are, for the most part, common sense and sound business practice; however, the Contractor is advised that federal, state, and local regulations exist which govern safety on the work site. Therefore, in addition to the following, the Contractor is responsible for adhering to the most stringent requirements in effect.
B. **Signage:** Prior to the preparation for work which will disturb lead, cadmium or chromium, the Contractor shall place warning signs immediately outside all entrances and exists to the area, warning that lead, cadmium and chromium work is being conducted in the vicinity. The signs shall be at least 20’ x 14” and read:

```
WARNING:
LEAD, CADMIUM, CHROMIUM WORK AREA
POISON
NO SMOKING, EATING OR DRINKING
ALLOWED IN THE WORK AREA
```

The signs shall be in bold lettering with lettering not smaller than two inches tall. Should personal exposure monitoring results indicate that exposures are below the Action Level, then the signs will not be required.

C. **Access to Work Areas:** It will be the Contractor's responsibility to allow only authorized personnel into the work area. Barrier tape shall be used to limit access to the exterior work area. Contractor shall maintain a bound logbook, in which any person entering or leaving the work area must sign and enter the dates and times of entry and departure. Should personal exposure results indicate the exposures are below the Action Level, then a logbook will not be required. The Contractor or competent person will not allow anyone access to the work area unless they have successfully passed an approved training program, and have been fitted and wearing a properly fitted respirator.

D. Dumpsters used to store hazardous waste shall be DOT approved, solid enclosed containers and locked and secured at all times.

E. Containment controls (including critical barriers, protective coverings, HEPA-filtered ventilation and decontamination facilities) may be required for renovation/demolition work. The degree of containment shall be appropriate for the anticipated levels of airborne dust. The lower the level of airborne dust, the lesser the requirements necessary to control lead, cadmium and chromium emissions at the job site.

F. The Contractor shall isolate work areas for the duration of work by completely sealing off all openings in the work area. Isolation scaling shall be accomplished by constructing critical barriers where necessary around the work area perimeter. The work area shall be sealed airtight to the greatest extent possible.

G. The Contractor shall erect one or more Decontamination Facilities (if applicable) to serve each work area. The facility will consist of series of two or more connected chambers including, at a minimum, a clean room and a shower/wash room, separated by an air lock. Unless otherwise specified, the shower/wash room shall be contiguous to the work area. Non-contiguous, remote, three-chamber decontamination facilities may be substituted with the Consultant’s prior written approval. Three-chamber decontamination facilities shall include an equipment room to be used for removal and temporary storage of contaminated worker clothing, equipment, and other items leaving the work area, prior to decontamination in the shower/wash room of the decontamination facility. In all cases, non-emergency access between contaminated and uncontaminated rooms or areas shall only be through the Decontamination Facility/Wash Room.
H. Ensure that barriers and linings are effectively sealed and taped at all times, and that the Shower/Wash Room floor is completely watertight. Repair damaged barriers, and remedy defects immediately upon discovery. Visually inspect enclosures at the beginning of each work period.

I. All renovation/demolition work areas shall remain isolated from all other trades on the project and remain inaccessible to the public. Contractor shall monitor the access to the renovation/demolition work areas. The below listed items are required to control the generation of lead, cadmium and chromium containing dust during renovation/demolition activities if worker exposure is above the PEL. The Contractor is ultimately responsible for cleaning all generated dust and debris from renovation/demolition operations and must maintain work areas free from dust generated from renovation/demolition activities.

1. Signs shall be posted at all approaches to the work area warning that work involving lead is being conducted in the vicinity. Signs shall be in bold lettering not smaller than two inches tall.

2. Barriers shall not be removed until the work areas are thoroughly cleaned and approved by the Consultant.

3.03 WORK PROCEDURES

A. The Contractor shall initiate, and continue, sufficient engineering and work practice controls, as described in the Contractor’s Compliance Programs, to reduce and maintain worker exposures to lead, cadmium and chromium at or below the Action Level or Permissible Exposure Limit.

B. The following work practices are specifically required by these specifications:

1. All persons except those directly involved in the work shall be excluded from the work area. Physical barriers shall be used, where necessary, to limit access to the work area for the duration of the renovation activities. (Warning signs may need to be posted in accordance with applicable regulations.)

2. Provide hand washing facilities and assure that all workers thoroughly wash their hands and face upon exiting the work area. Workers shall pay careful attention to cleanse the hands and face when decontaminating (Provide hygiene facilities, including shower, as required based on initial assessment and continued monitoring.)

3. Thoroughly wet the areas to be demolished and mist the air to reduce the potential for creating airborne lead, cadmium and chromium dust.

4. All equipment used by the workers inside the work area shall be either left in the work area or thoroughly decontaminated before being removed from the area. Extra work clothing (in addition to the disposable suits supplied by the Contractor) shall be left in the clean area until the completion of work in that area. The clean area shall be cleaned of all visible debris and disposable materials daily.

5. Under no circumstances shall workers or supervisory personnel eat, drink, smoke, chew gum, or chew tobacco in the work area; to do so shall be grounds for the Architect to stop all demolition operations. Only in the case of life threatening emergency shall workers or supervisory personnel be allowed to remove their protective respirators, if applicable, while in the work area. In this situation, respirators are to be removed for as short a duration as possible.

6. Feasible engineering controls shall be implemented by the Contractor to minimize the possibility of contamination of areas adjacent to the work area. The following activities are the minimum requirements of this section and affect the renovation/demolition performed on the project:
a. No torch cutting, mechanical sanding or stripping or abrasive methods of paint removal shall occur.

b. No renovation/demolition activities may occur which increase the workers exposure above the Action Level or Permissible Exposure Limit as described under OSHA.

7. Workers shall be informed of the components to be impacted during renovation/demolition that are identified as containing lead, cadmium and chromium.

8. Separation of Trades: Unprotected, untrained workers or trades shall not perform any related work within the same areas as demolition involving components identified as containing lead, cadmium and chromium. Other trades may not enter these areas until clean-up procedures are completed.

3.04 AIR SAMPLING – CONTRACTOR

A. Personal Exposure Monitoring: The Contractor shall perform personal exposure sampling to monitor personal exposure levels to airborne lead, cadmium and chromium. Samples shall be taken for the duration of the work shift or for eight hours, whichever is greater. Personal samples need not be taken every day after the first day if working conditions remain unchanged, but must be taken every time there is a change in the removal operation, either in terms of the location or the type of work. Sampling will be used to determine eight-hour Time-Weighted-Averages (TWA). The Contractor is responsible for personal sampling as outlined in the OSHA Standards.

B. Frequency: Air monitoring frequency will be established in accordance with the requirements set forth the OSHA Standards.

3.05 CLEAN-UP PROCEDURES

A. When work is in progress, the work site shall be cleaned at end of each day’s activities. The building shall be secured to prevent entry by any person after termination of workday. Durable equipment, such as power and hand tools, generators, and vehicles shall be cleaned monthly.

B. Clean-up shall also include all paint chips and/or debris existing prior to the start of the contract and as generated during construction. This shall also include any paint that becomes dislodged and falls to the floor as a result of construction activities.

C. Equipment shall be cleaned by HEPA vacuuming. Surfaces shall be maintained as free as practicable of accumulations of dust and debris. Clean up of dust and debris shall be accomplished with a HEPA vacuum or wet methods. The debris shall be misted with water with an airless type sprayer and collected with a mop or broom.

3.06 DISPOSAL OF WASTE MATERIAL

A. General:

All costs associated with proper disposal of the waste materials (whether hazardous, non-hazardous or regulated) shall be borne by the Contractor under the Base Bid. All materials, whether hazardous, non-hazardous or regulated shall be disposed of in accordance with all laws, and the provisions of this Section and any or all other
applicable federal, state county or local regulations and guidelines. It shall be the sole responsibility of the Contractor to assure compliance with all laws and regulations relating to disposal.

B. **Non-Hazardous Materials:** The Contractor shall contact the regional EPA, State and local authorities to determine disposal requirements for construction and demolition debris that contains lead, cadmium or chromium (non-hazardous). The Contractor shall be responsible for providing all dumpsters/containers required for collection and disposal of such material as well as disposal in an approved landfill.

C. **Hazardous Waste/Regulated Materials:** All materials which are determined to be hazardous waste or regulated waste for lead, cadmium or chromium shall be disposed of by the Contractor as specified herein. The Contractor shall perform representative Toxicity Characteristic Leaching Procedure (TCLP) tests of demolition debris to ensure the material is properly profiled for disposal. This shall also include all testing required by the disposal or recycling facility. All costs associated with TCLP testing to profile the waste material shall be borne by the Contractor. If the material is found to be hazardous waste or regulated waste, the Contractor shall provide appropriate drums/containers for use. The Contractor shall properly handle and transport all hazardous waste or regulated waste material into the drums/containers provided.

D. All TCLP sampling and analysis shall be subject to approval by the Owner. A submittal shall be provided by the Contractor which details the procedures for the sampling including the name of the sampler, methodology for sample collection, sample preparation and chain-of-custody procedures. The laboratory to be used shall be certified by the State of Massachusetts and the American Industrial Hygiene Association (AIHA).

E. No demolition or recyclable material shall be removed from the site unless approved by the Owner. The Contractor shall provide the name of the transporter and disposal facility for each type of waste (i.e. hazardous, non-hazardous, regulated or recyclable) for review and approval by the Owner.

F. **Recyclable/Salvaged Materials (Non-Hazardous):** The Contractor shall note that any demolition material deemed to be recyclable or salvageable by the Contractor may contain lead, cadmium or chromium which could result in the recycling or salvage facility rejecting acceptance regardless of the lead, cadmium or chromium content or TCLP result. The Contractor is hereby notified of this fact and shall bear all responsibilities and costs associated with acceptance and/or rejection of such materials in a C&D landfill, waste disposal facility and/or a recycling/salvage facility under their Base Bid.

G. The following materials are considered Hazardous Waste (Lead, Cadmium or Chromium) if they are generated in a form by themselves and shall be disposed of as such:

   a. Paint chip and paint chip debris

H. The Contractor shall be responsible for proper disposal of all materials outlined herein. In addition, all costs associated with worker protection or environmental protection requirements for such work shall be the responsibility of the Contractor.

END OF SECTION
PART 1- GENERAL

1.01 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.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 062000 Finish Carpentry
B. Section 096550 Resilient Wall Base
C. Section 099001 Painting

1.02 SUMMARY OF WORK

A. Extent of selective demolition work is indicated on drawings.
B. Types of Selective Demolition Work: Demolition required of the selective removal and subsequent offsite disposal by the General Contractor including, but not limited to, the following:

   High-Rise Vestibules
   1. Removal of existing entrance doors and frames
   2. Removal of vestibule flooring and related cementitious base
   3. Removal of floor grille, duct, and hot water fan coil unit

   Low-Rise Student Lounges
   1. Removal of vinyl base
   2. Removal of existing door valance
   3. Removal of existing sliding glass doors and frames
   4. Removal of existing CMU and brick masonry infill and related aluminum casement windows.
   5. Removal of carpet tile

C. Building Demolition Use such methods as required to complete work within limitations of O.S.H.A. and other governing regulations.

D. Remove all existing construction as indicated on the drawings and as otherwise required. Note that drawings are general. “Demolition” includes any incidental
existing construction which requires removal in order that the demolition of each existing building component is completed in its entirety.

1.03 JOB CONDITIONS:

A. Protections: Provide temporary barricades and other forms of protection as required to protect personnel from injury due to selective demolition work.
   1. Provide protective measures as required to provide free and safe passage of personnel.
   2. Remove protections at completion of work.

B. Damages: Promptly repair damages caused by demolition work at no cost to owner.

C. Remove from site and dispose of all demolished materials.

PART 2- PRODUCTS (Not Applicable)
PART 3- EXECUTION

3.01 INSPECTION:

A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions and equipment, which could be misconstrued as damage resulting from selective demolition work; file with Owner’s Representative prior to starting demolition or other work.

3.02 DEMOLITION:

A. Perform selective demolition work in a systematic manner. Use such methods, as required, to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
   1. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.
   2. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

B. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design and encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner’s Representative in written, accurate detail. Pending receipt of directive from Owner’s Representative, rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.03 DISPOSAL OF DEMOLISHED MATERIALS:

A. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site.
1. Burning of removed materials is not permitted on project site.

2. The General Contractor shall remove all demolished materials and rubbish at the end of each day. It shall be taken to places of legal disposal. All costs in this connection shall be paid by the General Contractor.

END OF SECTION
SECTION 035410
CEMENTITIOUS UNDERLAYMENT

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 SUMMARY

A. This Section includes cement-based, polymer-modified, self-leveling underlayment for interior finish flooring including the following:

1. Provide cementitious underlayment where required to provide slope or substrate for new flooring, as indicated or as scheduled.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 024100, SELECTIVE DEMOLITION.
2. Section 039030, CONCRETE REPAIR.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Plans indicating substrates, locations, and average depths of cement-based underlayment based on survey of substrate conditions.
1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer (applicator) who is acceptable to manufacturer, who has completed cement-based underlayment applications similar in material and extent to that required for this Project, and whose work has resulted in construction with a record of successful in-service performance.

B. Mockups: Before installing underlayment, apply mockups to demonstrate qualities of materials and execution. Comply with the following requirements, using materials indicated for the completed Work:

1. Designer will select one area or surface to represent surfaces and conditions for application on each substrate required.
2. Notify Designer seven days in advance of dates and times when mockups will be applied.
3. Obtain Designer's approval of mockups before starting underlayment application.
4. Maintain mockups, during underlayment application and until installation of finish flooring, in an undisturbed condition as a standard for judging the completed Work.
5. Approved mockups may become part of the completed Work if undisturbed when finish flooring is installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written recommendations for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.

B. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.

1.9 COORDINATION

A. Coordinate cement-based underlayment with requirements of finish flooring products, including adhesives, specified in Division 09 Sections.

B. Before installing surface sealers recommended by underlayment manufacturer, if any, verify compatibility with finish flooring installation adhesives.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. K-15 Premium Self-Leveling Underlayment Concrete; Ardex, Inc.; or approved equal.

2.2 PRODUCTS AND MATERIALS

A. Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in uniform thicknesses from 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
2. Compressive Strength: Not less than 4100 psi (28 MPa) at 28 days when tested according to ASTM C 109.
3. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm), or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).

D. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.

E. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of underlayment including substrate moisture content. Begin underlayment application only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions for substrate indicated. Provide clean, dry, neutral-pH substrate for underlayment application.

1. Treat nonmoving substrate cracks to prevent cracks from telegraphing (reflecting) through underlayment according to manufacturer's written recommendations.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond according to manufacturer's written instructions.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
2. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate if required to produce smooth surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install finish flooring over underlayment until after time period recommended by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 FIELD QUALITY CONTROL

A. Slump Test: If slump testing is recommended in writing by manufacturer, test underlayment for slump as it is placed for compliance with manufacturer's written recommendations.
B. Field Samples: Take at least three molded-cube samples from each underlayment batch. Test samples according to ASTM C 109 for compliance with compressive-strength requirements. When requested, provide test results to Designer.

3.5 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION
SECTION 039030

CONCRETE REPAIR

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 SUMMARY

A. This Section includes the following:

1. Subsequent patching and repairing of any concrete surfaces where patching or repair is required as a result of renovations as required to restore surface.
2. All other patching and repair of concrete damaged as a result of the installation and requiring patching and repair to restore finish surface to match adjacent.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 024100, SELECTIVE DEMOLITION.
2. Section 035410, CEMENTITIOUS UNDERLAYMENT.
3. Section 079000, JOINT SEALANTS; Joint fillers and elastomeric sealants.
4. Section 099001, PAINTING; Painting of patched areas.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.
1.5 SUBMITTALS

A. Product Data: Include material descriptions, chemical composition, physical properties, test data, and mixing and application instructions.
   1. Include Material Safety Data Sheets, if applicable.

B. Samples: Cured samples of patching materials.

C. Product Certificates: Signed by manufacturers certifying that products furnished comply with requirements and are recommended by manufacturer for uses indicated.

D. Qualification Data: For installers to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
   1. For products required to be installed by workers approved by product manufacturers, include letters of acceptance by product manufacturers certifying that installers are approved to apply their products.

E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of bonding agents with requirements indicated.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: In addition to other requirements in Division 01 Section “Quality Requirements,” retain installers that employ workers trained and approved by manufacturer to apply concrete patching and rebuilding materials.

B. Manufacturer Qualifications: In addition to other requirements in Division 01 Section “Quality Requirements,” manufacturers shall have factory-trained representatives who are available for consultation and Project site inspection at no additional cost.

C. Mockups: Build mockups for concrete removal and patching to demonstrate qualities of materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer’s original and unopened containers, labeled with type and name of products and manufacturers.

B. Comply with manufacturer’s written instructions for minimum and maximum temperature requirements and other conditions for storage.

C. Store cementitious materials off the ground, under cover, and in a dry location.

D. Store aggregates, covered and in a dry location, where grading and other required characteristics can be maintained and contamination avoided.
1.8 PROJECT CONDITIONS

A. Cold-Weather Requirements for Cementitious Materials: Do not apply unless air temperature is between 40 and 90 deg F (5 and 32 deg C) and will remain so for at least 48 hours after completion of Work.

B. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 deg F (32 deg C) and above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Latex Bonding Agent, Type II:
   a. Dayton Superior Corporation; Day-Chem Ad Bond (J-40).
   b. Euclid Chemical Company; FLEX-CON.
   c. Kaufman Products, Inc.; SureBond.

2. Cementitious Patching Mortar:
   a. Fosroc International Limited; Renderoc LA.
   c. Master Builders, Inc.; EMACO S66 CI, EMACO S77 CI, or EMACO S88 CI.
   d. Sika Corporation; SikaRepair 223 or SikaRepair SHB.

2.2 BONDING AGENTS

A. Latex Bonding Agent: ASTM C 1059, Type II at exterior locations and where indicated, Type I at other locations.

2.3 PATCHING MORTAR

A. Patching Mortar: Unless otherwise indicated, use one of the following:

1. Polymer-Modified, Cementitious Patching Mortar: Packaged, dry mix complying with ASTM C 928, that contains a non-redispersible latex additive as either a dry powder or a separate liquid that is added during mixing.
2.4 RELATED MATERIALS

A. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types I and II, non-load bearing and Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

B. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Euclid Chemical Company; CORR-BOND.
2. Sika Corporation; Armatec 110 Epocem.
4. Or approved equal.

C. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material "Type," "Grade," and "Class" to suit project requirements. Subject to compliance with requirements, provide one of the following products:

1. "Euco Epoxy System #452 MV or #620," Euclid Chemical Co.
4. Or approved equal.

D. Non-Shrink Grouts:

1. Grout for Interior Applications: Pre-mixed, non-staining, non-corrosive, non-shrink, non-metallic complying with CE CRD-C-621, Type D.
2. Grout for Exterior Applications: Provide Factory-packaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating. Provide Super Por-Rok, Erosion-Resistant Anchoring Cement, manufactured by Minwax Construction Products Division, or equal as approved by Designer.

E. Water for Hand Mixed Materials: Potable water.

2.5 READY-MIXED CONCRETE

A. Cement: Portland cement meeting ASTM C 150, Type I or II and ASTM C 94 supplied from an approved concrete plant.

1. Hand mixing shall not be allowed except as specifically authorized by the Designer.

B. Prepare design mixes for each type and strength of concrete as follows:
1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
2. Compressive Strength (28 Days): 4,000 psi.

C. Air Content: Add air-entraining admixture at manufacturer’s prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.0 percent, unless otherwise indicated:

1. Air Content: 5 percent for 3/4-inch nominal maximum aggregate size.
2. Do not air entrain concrete to trowel-finished interior floor slabs. Do not allow entrapped air content to exceed 3 percent.

D. Admixtures: Use admixtures according to manufacturer’s written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.6 MIXES (PATCHING MORTARS AND MORTAR REPAIR MATERIALS)

A. Mix products in clean containers according to manufacturer’s written instructions.

1. Add clean silica sand and coarse aggregates to products only as recommended by manufacturer.
2. Do not add water, thinners, or additives unless recommended by manufacturer.
3. When practical, use manufacturer’s premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
4. Do not mix more materials than can be used within recommended open time. Discard materials that have begun to set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Notify Designer seven days in advance of dates when areas of delaminated concrete and reinforcing bars will be located.

B. Locate areas of delamination using hammer or chain drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries of delaminated areas as directed by Designer.

3.2 PREPARATION

A. Protect people, motor vehicles, equipment, surrounding construction, Project site, plants, and surrounding buildings from injury resulting from concrete rehabilitation work.
1. Erect temporary protective covers over pedestrian walkways and at points of entrance and exit for people and vehicles that must remain in operation during course of concrete rehabilitation work. Construct covers of tightly fitted, 3/4-inch (19-mm) exterior-grade plywood supported at 16 inches (405 mm) o.c. and covered with asphalt roll roofing.

2. Protect adjacent equipment and surfaces by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.

B. Remove loose and deteriorated concrete or masonry.

1. Thoroughly clean removal areas of loose concrete, dust, and debris.

3.3 APPLICATION

A. Latex Bonding Agent, Type II: Mix with portland cement and scrub into concrete surface according to manufacturer's written instructions. If bonding agent dries, recoat before placing patching mortar or concrete.

B. Latex Bonding Agent, Type I: Apply to concrete by brush roller or spray. Allow to dry before placing patching mortar or concrete.

C. Mortar Scrub-Coat: Dampen repair area and surrounding concrete 6 inches (150 mm) beyond repair area. Remove standing water and apply scrub-coat with a brush, scrubbing it into surface and thoroughly coating repair area. If scrub-coat dries, recoat before applying patching mortar or concrete.

D. Patching Mortar: Unless otherwise recommended by manufacturer, apply as follows:

1. Wet substrate thoroughly and then remove standing water. Scrub a slurry of neat patching mortar mixed with latex bonding agent into substrate, filling pores and voids.

2. Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.

3. For vertical patching, place material in lifts of not more than 2 inches (50 mm) nor less than 1/4 inch (6 mm). Do not feather edge.

4. After each lift is placed, consolidate material and screed surface.

5. Where multiple lifts are used, score surface of lifts to provide a rough surface for application of subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.

6. Allow surfaces of lifts that are to remain exposed to become firm and then finish to a smooth surface with a wood or sponge float.

7. Wet-cure cementitious patching materials, including polymer-modified, cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

E. Concrete: Place according to industry standards and as follows:
1. Apply latex bonding agent to concrete substrate.
2. Use vibrators to consolidate concrete as it is placed.
3. At unformed surfaces, screed concrete to produce a surface that when finished with patching mortar will match required profile and surrounding concrete.
4. Where indicated place concrete by form and pump method.
   a. Design and construct forms to resist pumping pressure in addition to weight of wet concrete. Seal joints and seams in forms and junctions of forms with existing concrete.
   b. Pump concrete into place, releasing air from forms as concrete is introduced. When formed space is full, close air vents and pressurize to 14 psi (96 kPa).
5. Wet-cure concrete for not less than seven days by leaving forms in place or keeping surfaces continuously wet by water-fog spray or water-saturated absorptive cover.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to sample materials and perform tests as follows:

1. Patching Mortar, Packaged Mixes: Three (3) randomly selected samples tested according to ASTM C928.
2. Patching Mortar, Field Mixed: Three (3) randomly selected samples tested for compressive strength according to ASTM C109/C109M.

END OF SECTION
SECTION 055000

METAL FABRICATIONS

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 SUMMARY

A. Provide all metal fabrications work as indicated on the Drawings and as specified herein. Include, but do not limit to:

1. Miscellaneous brackets and supports for mechanical heating equipment.
2. Miscellaneous rough hardware.
3. All other metal fabrications indicated.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 024100, SELECTIVE DEMOLITION.
2. Section 035410, CEMENTITIOUS UNDERLAYMENT.
3. Division 23 - HVAC and Division 26 - ELECTRICAL; Hangers, brackets, troughs, guards, and other steel items for support or protection of Mechanical and Electrical work.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.
1.5  SUBMITTALS

A. Shop Drawings: Submit shop drawings of work showing size and thickness of each member, type of material, method of connection and assembly. Show dimensions, clearances, anchorages, relationships to surrounding work, coatings, and other pertinent details of fabrication and installation.

1. Show profiles, reinforcing, fasteners, and any accessories.

B. Product Data: Provide manufacturer's product data, installation instructions, use limitations, and recommendations for each material used. Provide certifications that materials comply with requirements.

C. Calculations: Where installed metal fabrication work is indicated to comply with certain design loadings, provide professionally prepared calculations, material properties, certification, and other information required for structural analysis of performance of work.

D. Welders Certification: Provide certifications, signed by Contractor, certifying that welders employed at project comply with requirements specified under AWS D1.1 and AWS D1.3.

1.6  QUALITY ASSURANCE

A. Engineering: Provide services of a professional engineer, registered in the State of Massachusetts to design and certify that work of this Section meets or exceeds performance requirements specified. Include design requirements for steel column supports, equipment supports, and all other items indicated.

B. Shop fabricate work to greatest extent possible. Label each piece in shop to facilitate field assembly.

C. Welding: Perform welding in conformance with AWS D1.1 and AWS D1.3, as applicable.

D. Exterior use and exterior applications, for the purposes of this Section, mean those materials or assemblies used in areas in exterior walls, roofs, foundations or exposed to weather. Interior use, for the purposes of this Section, means materials or assemblies in enclosed, conditioned spaces.

E. Pre-Construction Conference for Metal Fabrications: Contractor shall schedule a meeting to be attended by Contractor, Designer, fabricator, and galvanizer. Agenda shall include the following: Project schedule, scope of services, coordination between fabricator and galvanizer, finish of surfaces, application of coatings, submittals, and approvals.

F. Coordination Between Fabricator and Galvanizer:
1. Prior to fabrication and final submittal of shop drawings to Designer through the Contractor, direct fabricators to submit shop drawings to the galvanizer for all fabrications.
2. Direct galvanizer to review fabricator’s shop drawings for suitability of materials for galvanizing and coatings and coordinate any required modifications to fabrications required to be done by the fabricator.

1.7 PRODUCT HANDLING AND STORAGE

A. Store work off ground and under cover. Protect from damage. Repair and clean work before erection.

1.8 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

1. Provide products and materials of new stock, free from defects, and of best commercial quality for each intended purpose.
2. Steel to be galvanized finished shall be chemically suitable for galvanizing such that steel shall contain not more than the following elements: carbon below 0.25%, phosphorous below 0.5%, and manganese below 1.35%.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: ASTM A 500 or A 501, hot or cold rolled, as required for design loading.

D. Steel Pipe: ASTM A 53, schedule 40, Type S (seamless), black except where galvanized is indicated, Grade A for cold-bending.

E. Seamless Steel Pipe: ASTM A106B.

F. Steel Sheet: ASTM A 366, A 570, or A 611, grade required for design loading.

G. Iron Castings: ASTM A 47, or A 48, grade and class are manufacturer’s options.
H. Bolts and Fasteners: ASTM A 307 and A 325.

I. Inserts: Threaded or wedge type, galvanized ferrous castings; either ASTM A 47 malleable iron, or ASTM A 27 cast steel. Provide threaded inserts and wedge inserts manufactured by one of the following or Designer approved equal:

1. Hohmann and Barnard.
2. Gateway Erections, Inc.
3. Richmond Screw Anchor Co.

J. Provide anchors, bolts, sockets, sleeves, and other parts required for securing each item of work to other construction.

K. Provide exposed fastenings of same material and finish as metal to which applied, unless otherwise noted.

L. Welding Rods: Conform to AWS Standards and recommendations of welding rod manufacturer.

M. Grout for Interior Applications: Pre-mixed, non-staining, non-corrosive, non-shrink, non-metallic complying with CE CRD-C-621, Type D.

N. Grout for Exterior Applications: Provide Factory-packaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating. Provide Super Por-Rok, Erosion-Resistant Anchoring Cement, manufactured by Minwax Construction Products Division, or equal as approved by Designer.

2.2 FABRICATION - GENERAL

A. Fabricate work of this Section to be straight, plumb, level and square, and to sizes, shapes and profiles indicated on approved shop drawings. Ease exposed edges. Cut, reinforce, drill and tap metal work as required for proper assembly.

1. Fabricate miscellaneous supports, brackets, braces and the like required to fully complete the work.

2. Obtain loading requirements from suppliers of work to be supported. Design and support systems with a safety factor of at least 6 unless otherwise indicated.

3. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

   a. Temperature Change (Range): plus or minus 50 degrees F, total range 100 degrees F.

4. Shear and punch metals accurately. Remove burrs.
5. Ease exposed edges to a radius of approximately 1/32 in., unless indicated otherwise. Form bent corners to smallest radius possible without causing grain separation or impairing work.

6. Remove sharp or rough areas on exposed traffic surfaces.

7. Weld seams continuously. Spot welding is permitted for temporary welding only.

8. Weld corners and seams continuously to comply with the following:
   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove welding flux immediately.
   d. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

B. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

C. Provide for anchorage of type shown; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support required loads.

D. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

E. Cut, reinforce, drill, and tap metal fabrications as shown to receive finish hardware, screws, and similar items.

F. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

G. Galvanizing: Hot-dip galvanize exterior metal fabrications, items located in exterior wall assemblies, on roof, and other items shown to be galvanized. Comply with galvanizing requirements of this Section.
   1. Hot-dip galvanize exterior metal fabrications, items located in exterior wall assemblies, and other items indicated to be galvanized, in compliance with ASTM A 123, ASTM A 153, or ASTM A 386.
   2. Provide minimum 1.5 oz./ft.² zinc coating. Galvanize after fabrication.

H. Work Exposed to View: For work exposed to view, select materials with special care. Provide materials which are smooth and free of blemishes such as pits, roller marks, trade names, scale and roughness. Fabricate work with uniform hairline joints. Form welded joints and seams continuously. Grind welds flush to be smooth after painting. For exposed fasteners, use hex head bolts or Phillips head machine screws.
I. Steel Brackets for Support of New Fin Tube Radiation: 5/16 in. thick x 4 in. wide x 4-1/2 in. short leg x 12 in. long leg steel bracket. Bracket shall be shop-coated with primer for field painting of finish coat under Section 099001. PAINTING.

2.3 HOT-DIP GALVANIZING AND SHOP PRIMING OF GALVANIZED SURFACES

A. Galvanizing: For those items shown for galvanizing, apply nickel zinc coating by the hot-dip process complying with the following requirements:
   1. ASTM A 153 for galvanizing iron and steel hardware.
   2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.

B. Hot-Dip Galvanizing: Provide coating for iron and steel fabrications applied by the hot-dip process with 0.05 to 0.09 percent nickel and other earthly materials in the galvanizing kettle forming an alloy, DELTAGALV by Duncan Galvanizing or approved equal meeting all requirements of this specification. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards.

C. Factory-Applied Universal Primer: Provide factory-applied polyamide epoxy primer, 2.0 -3.0 mils dry film thickness, PRIMERGALV by Duncan Galvanizing, or Tnemec 27 Typoxy meeting all requirements of this specification. Blast clean galvanized surfaces prior to application of primer in accordance with SSPC SP 7, including use of abrasive media, to achieve an anchor profile of 0.75 mils uniformly. Primer shall be applied in a controlled environment meeting applicable environmental regulations, and as recommended by coating manufacturer. Primer shall be compatible with field-applied finish coats specified in Section 099001, PAINTING.

D. Galvanizing Application: Galvanize materials in accordance with specified standards and this specification. Galvanizing shall provide an acceptable substrate for applied coatings. The dry kettle process shall be used to eliminate any flux inclusions on the surface of the galvanized material.

E. Metal Coating Application: Apply metal coatings over hot-dip galvanizing in accordance with specified requirements.

2.4 FINISHING (NON-GALVANIZED SURFACES)

A. Shop Primer for Ferrous Metal not Indicated to Be Galvanized: Fast-curing, lead- and chromate-free, zinc rich primer, Tnemec Zinc-Rich Primer 90-97 at 3.0 to 3.5 mils dry film thickness or equal, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems shown, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
   1. Surface preparation for shop coating shall be SSPC SP 6.

B. Bituminous Paint: Bituminous-based paint for electrolytic isolation shall be cold applied black asphaltic mastic conforming to SSPC Paint 12, with no asbestos fibers.
PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorage devices, setting drawings, diagrams, templates, instructions, and directions for installation of concrete inserts, sleeves, anchor bolts, and miscellaneous items to be embedded or attached to concrete work, masonry work, or structural steel work.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners necessary for securing work of this Section to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Erect work square, plumb and true, accurately fitted, and with tight joints and intersections. All anchors, inserts and other members to be set in concrete or masonry shall be furnished loose by this trade to be built-into concrete and masonry by those trades. Avoid field cutting or drilling to greatest extent possible.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

F. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
5. Needle gun surfaces of welded connections which will be painted to restore surface profile.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
H. Field Welding: Comply with AWS D1.1 for procedures of manual metal-arc welding, appearance and quality of welds, and correction methods for defective welds.

I. Where members other than expansion bolts or inserts are fastened into concrete, set such members in proprietary-type expanding grout manufactured specifically for such purpose. Use grouts strictly in accordance with manufacturer’s directions. Form to receive members with galvanized metal sleeves, or other approved method to provide at least 1/2 in. clearance around entire perimeter. At exposed applications, hold expanding grout back 1/2 in. from finish surface and fill voids with Portland cement grout to match color and texture of surrounding concrete surface.

J. Electrolytic Isolation: Where dissimilar metals are to come into contact with one another, isolate by application of a heavy coating of bituminous paint on contact surfaces in addition to shop coat specified above. Do not permit the bituminous paint in any way to remain on surfaces to be exposed or to receive sealant.

K. Miscellaneous Items: Carefully review Drawings for miscellaneous metal items required by various trades but not specifically listed above, such as miscellaneous clip angles, miscellaneous steel bracketing, bracing, supports, and other miscellaneous metal items as indicated on Drawings, reasonably implied therefrom, or reasonably necessary for thorough completion of work.

3.3 REPAIRING, CLEANING, AND PROTECTION

A. Touch-Up and Repair: For damaged and field-welded metal coated surfaces, clean welds, bolted connections and abraded areas.

1. At galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A 780. Galvanizing repair paint shall have 65 percent zinc by weight, ZIRP by Duncan Galvanizing, Tnemec 90-97 Zinc-Rich Primer, or approved equal. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A 123 or ASTM A 153, as applicable. Touch-up of galvanized surfaces with aerosol spray, silver paint, bright paint, or aluminum paints shall not be acceptable.

2. At factory-primed surfaces, touch-up finish in conformance with manufacturer’s recommendations. Provide touch-up such that repair is not visible from a distance of 2 ft.

END OF SECTION
SECTION 061005
MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

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 SUMMARY

A. Provide all miscellaneous carpentry work as indicated on the Drawings and as specified herein. Include, but do not limit to:

1. Wood blocking and nailers and miscellaneous carpentry as required for the renovation work including window and door replacement as indicated.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 024100, SELECTIVE DEMOLITION.
2. Section 062000, FINISH CARPENTRY; Interior wood trim.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.

1.5 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

1.6 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
5. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
   a. Preservative-treated wood.
   b. Fire-retardant-treated wood.
   c. Power-driven fasteners.
   d. Powder-actuated fasteners.
   e. Expansion anchors.
   f. Metal framing anchors.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

   1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

3. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
   a. Ammoniacal, or amine, copper quat (ACQ).
   b. Ammoniacal copper citrate (CC).
   c. Copper azole, Type A (CBA-A).

B. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

1. Application: Treat items indicated on Drawings, and the following:
   a. Wood sills, sleepers, blocking, furring, strapping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber.
2. Use treatment that does not promote corrosion of metal fasteners.
3. Use exterior type for exterior locations and where indicated.

2.4 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

1. Grade: Construction, Stud, or No. 2 grade.
2. Species: Provide any of the following species:
   a. Mixed southern pine; SPIB.
   b. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
   c. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

2.5 FASTENERS

   A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

   1. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel.

   B. Power-Driven Fasteners: CABO NER-272.

   C. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

   D. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).

   E. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

   F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.


2.6 METAL FRAMING ANCHORS

   A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and acceptable to authorities having jurisdiction.


PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

   A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.

E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.

F. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION
SECTION 062000
FINISH CARPENTRY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

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 SUMMARY

A. Provide all finish carpentry work as indicated on the Drawings and as specified herein. Include, but do not limit to:
   1. Interior standing and running trim, including window blind pocket.
   2. All other finish carpentry work indicated.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 061005, MISCELLANEOUS CARPENTRY for wood blocking and nailers.
   2. Section 099001, PAINTING for painting of interior trim.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.

1.5 QUALITY STANDARDS

A. Source: For each material type required for work of this Section, provide primary materials which are product of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of three years’ experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products only after wet work has been completed and environmental conditions similar to those of the finished work are established and maintained. Store and handle work to prevent deterioration and damage. Comply with AWI Quality Standards and recommendations. Sequence deliveries to avoid delays, but minimize on-site storage.

1.7 PROJECT CONDITIONS

A. Substrates: Proceed with work only when substrate construction and penetration work is complete.

B. Wet Work: Proceed with work of this Section after wet work has been complete and fully dry or cured. Wet work is defined as plaster, gypsum drywall, paint, concrete, etc.

C. Conditioning: Advise Contractor of temperature and humidity requirements for woodwork installation. Do not install work of this Section until required temperature and relative humidity in areas of installation has been stabilized and will be maintained.

D. Environmental Limitations: Do not deliver or install millwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

E. Field Measurements: Where finish carpentry is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.

2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating millwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 FINISH CARPENTRY, GENERAL

A. Do not deliver materials to site until building has been closed in, wet work is completed and sufficiently dry and building is continuously maintained at a temperature above 65°F. Obtain Designer's approval before delivering materials or fabricated items. Store materials off the floor, fully protected from damage.

B. Provide fasteners and hardware required to complete the work. Use concealed fastenings wherever possible. Provide cadmium plated or zinc chromate plated fasteners at concealed locations; stainless steel or chrome plated at exposed interior locations.
C. Provide materials and products which meet or exceed the requirements of the indicated AWI Quality Standards specified for each type of work.
   1. Painted Finish: AWI Quality Standards, Custom Grade.

D. Provide solid lumber, kiln-dried to moisture content of 5% to 10% by weight, with average not to exceed 8%.

E. Furnish lumber in longest practical lengths. Use single-length pieces wherever possible.

F. Take necessary field measurements before starting fabrication of built-in work.

G. Adhesives, adhesive bonding primers, or adhesive primers used on this Project shall meet or exceed the VOC content limits of the State of California South Coast Air Quality Management District (SCAQMD) Rule #1168 – Adhesive and Sealant Applications’.

2.2 FINISH CARPENTRY, MATERIALS - GENERAL

A. Materials: Solid stock hardwood for exposed painted finish shall be plain sawn/sliced pine or white poplar, conforming to AWI Quality Standards for Custom Grade.

B. Standing and Running Trim: Standing and running trim work includes, but is not limited to, the following:
   1. Interior trim at vertical blind pocket.
   2. All other interior trim indicated.

C. Quality Standard: Provide AWI Premium Grade materials and workmanship, unless noted otherwise.
   1. Finger jointed material will not be permitted.

D. Wood Species and Cuts: Provide as follows:
   1. Painted Work: Poplar or Pine complying with AWI Quality Standards.

E. Shop Assembly: Shop assemble casings and frames with accurately mitered joints, pressure glued with lemon shaped splines.

2.3 FINISHING

A. Scope: Shop finishing work includes, but is not limited to, the following:
   1. Painted Finish: Provide prime coat complying with Section 099001, PAINTING.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND INSTALLATION REQUIREMENTS

A. Dressed and sand finish carpentry work free from machine and tool marks, abrasions, raised grain, or other defects on surfaces exposed to view.
B. Provide tight joints formed to conceal shrinkage. Fit butt joints with concealed spline. Glue and dowel shop miters which are four inches or greater. Glue and spline miters less than 4 in., with spline concealed.

C. Blind nail finish work to the greatest extent possible. Where surface nailing is used, set and fill nails to match adjacent wood.

D. Wherever nailing into concrete is done, care shall be taken to protect pipes or conduits embedded in the slab. No puncturing of pipes or conduits will be allowed. Damage to embedded work shall be corrected without further cost to the Commonwealth. Inserts and anchor bolts shall be placed before the pouring of concrete.

E. Secure work to prevent checks or warps. Finish carpentry work shall be properly framed, closely fitted, and accurately set to the required lines and levels and shall be rigidly secured in place.

3.2 PAINTING AND FINISHING

A. Field painting and finishing is specified under Section 099001, PAINTING. All finish carpentry items shall be primed or sealed, as work of this section, before installation. Paint or seal coats must be dry before items are installed.

B. Sand all finish work at field joints and where required by installation.

3.3 SPECIFIC INSTRUCTIONS

A. Important Note: No attempt is made in the following specific instructions to list all elements of finish carpentry required on this project. It is the responsibility of the Contractor to determine for himself from the Drawings the scope and nature of the work required. These specific instructions are intended only to provide additional instructions regarding those portions of the finished carpentry for which information beyond that given on the Drawings or covered in the AWI Quality Standards seems needed to properly describe the work. Where the scope of a category is listed it is done in a general manner to assist the Contractor in determining the general nature of work he shall look for as being required in said category, and not to limit the work.

3.4 FINISH CARPENTRY WORK

A. Fabricate and install finish carpentry work in accordance with the Drawings, the specifications, and AWI Quality Standards applicable or referenced to this work.

B. Miscellaneous Items: Install all required standing and running trim and other miscellaneous items throughout, as indicated on the Drawings and as required to satisfactorily complete the entire work, whether or not each and every required piece is specifically indicated on the Drawings. Trim shall be of same material and finish as the larger member to which applied.
3.5 COMPLETION

A. Just prior to completion of work of this Section, inspect work in the company of Designer and make adjustments and corrections to work leaving operating parts in perfect operating condition, all jointing to adjacent material tight, all surfaces without blemishes or stains, all work properly executed and complete, and all defects and damaged work replaced or corrected.

END OF SECTION
SECTION 079000
JOINT SEALANTS

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 WORK INCLUDED

A. Caulk and seal joints as specified. Include, but do not limit to:
   1. Sealing of interior and exterior perimeter joints at door frames, storefront, window frames, vents, louvers, and other wall openings.
   2. All other interior and exterior sealing called for and as required.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 084115, ALUMINUM FRAMED ENTRANCES, STOREFRONT, AND WINDOWS for aluminum framing.
   2. Section 099001, PAINTING for painting.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer’s printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each sealant material used. Provide certifications that sealant materials comply with specified requirements.
B. Initial Selection Samples: Submit samples manufacturer’s color charts showing complete range of colors, textures, and finishes available for each material used.

C. Verification Samples: Submit actual representative samples of each sealant material that is to be exposed in the completed work. Show full color ranges and finish variations expected. Provide sealant samples having minimum size of 4 in. long.

D. Test Reports: Provide certified reports for all specified tests.

E. Certificate of Product Compliance: Manufacturer’s certificate evidencing compliance of sealants, sealant primers, and accessory materials with requirements of this Section.

1.6 COMPATIBILITY

A. Provide sealant and sealant joint backing materials suitable for the use intended and compatible with the materials with which they will be in contact. Compatibility of sealant and accessories shall be verified by the sealant manufacturer.

1.7 QUALITY ASSURANCE

A. Source: For each sealant material type required for the work of this section, provide primary materials which are the product of one manufacturer. Provide secondary or accessory materials which are acceptable to the manufacturers of the primary materials.

B. Installer: A firm with a minimum of five years’ experience in type of work required by this Section and which is acceptable to the manufacturers of the primary materials.

C. Mock-Ups: Prior to commencing the primary work of this Section, provide mock-ups at locations acceptable to Designer. Obtain Designer’s acceptance of visual qualities. Protect and maintain accepted mock-ups throughout the remainder of the work of this section to serve as criteria for acceptance of the work.

D. Volatile organic compound (VOC) content of sealants and sealant primers used on this Project shall not exceed the limits defined in Regulation 8 (Organic Compounds), Rule 51 (Adhesive and Sealant Products) of the Bay Area Air Quality Management District (BAAQMD) of the State of California.

1.8 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within the limits established by manufacturers of the materials and products used.

B. Substrates: Proceed with work only when substrate construction and penetration work is complete.

1.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Materials under this Section shall be delivered to, and stored at, the job site in unbroken factory sealed containers with labels intact.
WARRANTY

A. Furnish joint sealant manufacturer’s written single-source performance warranty that joint sealant work will be free of defects related to workmanship or material deficiency for five years from date of Substantial Completion of the Project.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Before installation check each sealant for compatibility with adjacent materials and surfaces and with indicated exposures. Select sealers which are recommended by manufacturer for each application indicated. Where exposed to pedestrian or vehicular traffic, provide sealants which are non-tracking and are strong enough to withstand the traffic without damage.

B. Sealants and sealant primers used on this Project shall not exceed the VOC limits defined in Regulation 8 (Organic Compounds), Rule 51 (Adhesive and Sealant Products) of the Bay Area Air Quality Management District (BAAQMD) of the State of California.

2.2 NON-SAG POLYURETHANE SEALANT

A. Provide multi-part, non-sag, polyurethane based elastomeric sealant, complying with ASTM C 920 Type M, Grade NS, Class 25, Fed. Spec. TT-S-00227E Class A, having Shore A hardness of 20 to 30, cured modulus of elasticity at 100% elongation of not more than 75 psi, and tear resistance of not less than 50 lbs./inch when tested according to ASTM D 624.

B. Provide one of the following products that meet or exceed specified requirements:

2. Sika Sikaflex 2c NS.
4. Tremco Dymeric.

C. Where joint requires 50% movement capabilities, provide Tremco Dymeric Plus, or equal product approved by Designer.

D. Extent: Provide non-sag polyurethane sealant for all metal to metal joints, metal to concrete joints, metal to metal joints, masonry to metal joints, masonry to masonry joints, and other joints not indicated to be sealed with another type of sealant.

2.3 SELF-LEVELING POLYURETHANE SEALANT

A. Provide two or more part, self-leveling, polyurethane based elastomeric sealant, complying with ASTM C 920, Fed. Spec. TT-S-00227E Type 1 Class A, having Shore A hardness of not less than 30 when tested according to ASTM C 920, cured modulus of elasticity at 100% elongation of not more than 150 psi when tested according to ASTM D 412, and tear resistance of not less than 50 lb./inch when tested according to ASTM D 624.
B. Where joint surfaces contain bituminous materials, provide modified sealants which are compatible with bituminous materials encountered.

C. Provide one of the following products that meet or exceed specified requirements:
   2. Sika 2C, SL.
   3. Sonneborn Sonolastic PVT.
   4. Tremco THC 900.

D. Extent: Provide self-leveling polyurethane sealant for joints not indicated to be sealed with another type of sealant.

2.4 SILICONE SEALANT

A. Provide one part, silicone rubber based elastomeric sealant, complying with ASTM C 920 Type S, Class 25, Grade NS and Fed. Spec. TT-S-001543A Class A.

B. Provide mold and mildew resistant, sanitary interior type sealant.

C. Provide one of the following products that meet or exceed specified requirements:
   1. Dow 786.
   2. General Electric 1702 Sanitary.
   3. Pecora 863.
   5. Tremco Proglaze.

D. Extent: Provide silicone rubber sealant for interior joints around plumbing fixtures.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Provide primer recommended by sealant manufacturer for surfaces to be adhered to.

B. Bond Breaker Tape: Provide polyethylene or other plastic tape recommended by sealant manufacturer to prevent three-sided adhesion.

C. Backer Rod: Provide compressible rod of durable nonabsorptive material recommended by sealant manufacturer for compatibility with sealant. Provide products of one of the following manufacturers:
   1. Backer Rod Manufacturing and Supply Co.
   2. Dow Chemical Co.
   4. Woodmont Products, Inc.

D. Joint backing for general use at joints in horizontal surfaces shall consist of two rows of butyl rubber or neoprene foam rod in contact with one another, and each compressed to approximately 2/3 original width when in place.
E. Precompressed Expanding Sealant Tape: Emseal PC-SA, or approved equal.

F. Provide miscellaneous materials of type that will not bleed through sealant, discolor surface, or produce other deleterious effects. Select size to provide compression to approximately 2/3 original width when in place. Provide backing material profile concave to the rear of the sealant, and equipped with a bond-breaking film.

PART 3 - EXECUTION

3.1 INSPECTION

A. The Installer shall examine substrates and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning of sealant work means Installer's acceptance of joint surfaces and conditions.

3.2 PREPARATION

A. Strictly comply with manufacturers' instructions and recommendations, except where more restrictive requirements are specified in this Section.

B. Clean joint surfaces immediately before installation of sealants, primers, tapes and fillers. Remove substances which could interfere with bond. Etch or roughen joint surfaces to improve bond. Surfaces which have been given protective coatings and those that contain oil or grease shall be thoroughly cleaned with xylol or MEK solvent, with due precautions taken to minimize hazards.

C. Unless otherwise indicated, use of sealants shall conform to the following: ASTM C 790 for latex sealants and ASTM C 962 for other sealants.

D. Tape or mask adjoining surfaces to prevent spillage and migration problems.

E. Prime surfaces as recommended by sealant manufacturer.

3.3 INSTALLATION

A. Provide backer rods for joint sealants except where specifically recommended against by sealant manufacturers.

B. Prevent three-sided adhesion by use of bond breaker tapes or backer rods.

C. Force sealant into joints to provide uniform, dense, continuous ribbons free from gaps and air pockets. Completely wet both joint surfaces equally on opposite sides.

D. Except in hot weather, make sealant surface slightly concave. Install sealants so that compressed sealants do not protrude from joints. Dry tool sealants to form a smooth dense surface. At horizontal joints form a slight cove to prevent trapping water.
E.  Provide sealants to depths indicated, or if not indicated, follow manufacturer's recommendations. For joints up to 3/8 in. width, depth of joint shall not exceed 1/2 in.; for joints larger than 1/2 in. width, depth of joint shall not exceed 5/8 in.

3.4 EXTENT OF SEALANT WORK

A.  General Extent: Seal joints at all interior and exterior joints, seams, and intersections between dissimilar materials. Provide elastomeric sealant installation with backer rod in all interior and exterior control joints.

B.  Interior and Exterior Sealing: The work of this Section includes sealing the following at all work included under this Contract:

   1.  Perimeters of aluminum frames for storefront and entrances.
   2.  All other sealant indicated.

3.5 CURING

A.  Cure sealants in strict compliance with manufacturers' instructions and recommendations to obtain highest quality surface and maximum adhesion. Make every effort to minimize accelerated aging effects and increase in modulus of elasticity.

3.6 CLEANING AND PROTECTION

A.  Remove smears from adjacent surfaces immediately, as the work progresses. Exercise particular care to prevent smearing or staining of surrounding surfaces which will be exposed in the finished work, and repair any damage done to same as result of this work without additional cost to the Commonwealth.

B.  Remove and replace work that is damaged or deteriorated.

C.  Clean adjacent surfaces using materials and methods recommended by sealant manufacturer. Remove and replace work that cannot be successfully cleaned.

D.  Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protection immediately before final acceptance.

END OF SECTION
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 WORK INCLUDED

A. Provide aluminum framed entrance, storefront, and window work as indicated on the Drawings and as specified herein, including, but not limited to the following:

1. Vestibule Entrances: Aluminum framed entrance frame with insulated sidelights, and flush FRP doors.
2. Balcony Fenestration: Aluminum framed heavy-walled storefront, insulated metal panels glazed into storefront frame, heavy wall hinged entrance doors, casement window inset in storefront framing, and all other work indicated.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 039030, CONCRETE REPAIR; Concrete repair work.
2. Section 055000, METAL FABRICATIONS; Miscellaneous supports.
3. Section 061005, MISCELLANEOUS CARPENTRY; Wood framing and blocking.
4. Section 079000, JOINT SEALANTS; Sealant and joint filler requirements.
5. Section 087100, HARDWARE; Hardware sets and cylinders.
6. Section 088001, GLASS AND GLAZING; Glass and glazing requirements.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.
1.5 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of work. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others. Show interfaces and relationships to work of other trades.

C. Field Measurements: Take necessary field measurements before preparation of shop drawings and fabrication. Do not delay progress of job. If field measurements are not possible prior to fabrication, allow for field cutting and fitting.

D. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.

E. Verification Samples: Submit representative samples of each material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

F. Calculations: Provide professionally prepared calculations and certification of performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied.

G. Test Reports: Provide certified test reports for specified tests.

1.6 QUALITY ASSURANCE

A. Source: For each material type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of three years’ experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.

C. Design Criteria: Drawings indicate sizes, member spacings, profiles, and dimensional requirements of work of this Section. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in the Designer's sole judgment, such deviations do not materially detract from the design concept or intended performances.

D. Engineering: Provide services of a Professional Engineer, registered in the jurisdiction in which the Project will be built, to design and certify that work of this Section meets or exceeds performance requirements specified.
1.7 TESTS AND PERFORMANCE REQUIREMENTS

A. Manufacturer's Standard Tests: Provide manufacturer's standard test data showing compliance with specified requirements. Provide specified tests if manufacturer's standard storefronts have been modified, or when custom storefronts are used.

B. Test Units: Provide entrance units for testing fully glazed and assembled in accordance with Contract Documents. Provide test unit sizes at least as large as largest storefront bay used on this project, and in no case smaller than unit sizes listed in Chart A of AAMA Publication GS-001.

C. Test Sequence: Test sequence is optional, except that air infiltration tests shall precede water resistance tests.

D. Air Infiltration Test: Test unit in accordance with ASTM E 283, as follows:
   1. Static Air Pressure Difference: 6.24 psf for fixed units, and 1.567 psf for doors.
   2. Performance: Maximum air leakage shall not exceed the following:
      a. Door Units: 0.50 cfm per sq. ft. of single doors, 1.00 cfm per sq. ft. for doors hinged in pairs.

E. Water Leakage Test: Test fixed framing system in accordance with ASTM E 331.
   2. Performance: No leakage as defined in test method at specified test pressure.

F. Uniform Load Deflection Test: Test units in accordance with ASTM E 330, at following static air pressure difference (Design Wind Pressure), or loads prescribed by code for this project site, whichever is greater. Apply pressure first to exterior side (positive) and then interior side (negative).
   1. Design Wind Pressure: 35 pounds per square foot minimum.
   3. Performance: Deflection in each member measured at locations of greatest deflection shall not exceed L/175 at specified Design Wind Pressure.

G. Uniform Load Structural Test: Test units in accordance with ASTM E 330 at following static air pressure difference. Apply high pressure load first on one side and then on other side. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or activating mechanisms.
   1. Static Air Pressure: Minimum 1.5 times the Design Wind Pressure.
   2. Permanent Deformation in Any Member: Not to exceed 0.2% of member span.

H. Condensation Resistant Factor: Not less than 48 for door; per AAMA 1502.7.

I. Thermal Movement: Provide aluminum entrance and framing that allow for expansion and contraction of members throughout an ambient temperature range of 100°F.
1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from weather damage.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.9 WARRANTIES

A. Provide written warranty, signed by manufacturer, installer, and Contractor, agreeing to repair or replace work that exhibits defects in materials or workmanship. "Defects" is defined to include, but not limited to, leakage of water, abnormal aging or deterioration, abnormal deterioration or fading of finishes, and failure to perform as required. Include requirement for removal and replacement of covering and connected adjacent work.

1. Warranty period (Aluminum Framing): Three years from date of Substantial Completion.
2. Warranty period (Entrance Doors): Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/PRODUCT

A. Acceptable Manufacturers: Provide aluminum storefronts and aluminum-framed entrance systems of one of the following manufacturers, or Designer approved equal, that meet or exceed requirements of these specifications:

1. Kawneer Company, Inc.
2. Wausau Metals Corporation.
3. EFCO.
4. Vistawall.

B. Entrance Doors:

1. Aluminum entrance door indicated on the Drawings is based on Kawneer 350 Medium Stile Door, manufactured by Kawneer, Inc.
2. FRP entrance door indicated on the Drawings is based on Kawneer Flushline FRP Entrance; urethane foam-filled door, flush face design, high traffic and high abuse, manufactured by Kawneer, Inc.

C. Aluminum Framing for Entrance Door and Storefront Framing: Kawneer VG TriFab 451T with 2 inch Sightline, Center Glazed, 2 in. x 4-1/2 in. aluminum framing, manufactured by Kawneer Company, Inc., or approved equal.

D. Window: Kawneer Casement for Glazing into Storefront Framing.

E. Interior Security Screen: Kane Manufacturing matching University Standards.

F. Threshold: Extruded aluminum, type and size as detailed.
2.2 MATERIALS AND ACCESSORIES

A. Aluminum Members: Provide 6063-T5 alloy and temper as recommended by manufacturer for strength, corrosion resistance, and application of required finish. Comply with ASTM B 221 for extrusions and ASTM B 209 for sheet/plate. Provide 0.125 in. thick extrusions for door stiles and storefront framing. Provide 0.050 in. thick aluminum for glazing moldings.

B. Fasteners: Provide aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components. Exposed fasteners shall match finish of members and hardware being fastened.

C. Concealed Flashing: Dead-soft stainless steel, 26 gage minimum, or extruded aluminum, 0.062 in. minimum, of an alloy and type selected by manufacturer for compatibility with other components.

D. Brackets and Reinforcements: Manufacturer’s high-strength aluminum units where feasible; otherwise, non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.

E. Concrete/Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.

F. Bituminous Coatings: Cold-applied asphalt mastic compounded for 30-mil thickness per coat.

G. Compression Weatherstripping: Manufacturer’s standard replaceable stripping of molded neoprene or PVC gaskets complying with ASTM D 2287.

H. Sliding Weatherstripping: Manufacturer’s standard replaceable stripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing.

I. Sealant and Backer Rod: Refer to Section 079000, JOINT SEALANTS.

2.3 HARDWARE

A. Provide hardware units as indicated, scheduled, or required for operation of doors.

1. Refer to Section 087100, HARDWARE for Hardware Schedules.

2.4 FABRICATION

A. Sizes and Profiles: Required sizes for door and frame units, including profile requirements, are indicated on Drawings. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve design requirements and coordination with other work.
B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.

1. Preglaze door and frame units to greatest extent possible, in coordination with installation and hardware requirements.
2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
3. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.

C. Welding: Comply with recommendations of American Welding Society to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

D. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator to prevent corrosion.

E. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

F. Fasteners: Conceal fasteners wherever possible.

G. Provide EPDM/vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

H. At interior doors and other locations without weatherstripping, provide neoprene sealers on stops to prevent metal-to-metal contact.

2.5 ALUMINUM FRAMING AND STOREFRONT

A. General: Provide inside-outside matched resilient flush-glazed system with provisions for glass replacement. Shop fabricate and preassemble frame components where possible.

B. Thermal-Break Construction: Fabricate aluminum storefront framing system with integrally concealed, low conductance thermal barrier, located between exterior materials and exposed interior members, in manner which eliminates direct metal-to-metal contact. Provide manufacturer’s standard construction which has been in use for similar projects for at least three years.

C. Framing shall be glazed with 1 inch thick insulating glass as indicated, meeting requirements of Section 088001, GLASS AND GLAZING.

2.6 ENTRANCE DOORS

A. Aluminum entrance doors shall be factory-glazed aluminum doors with standard aluminum frames, manufactured by same manufacturer as aluminum framing. Aluminum entrance doors shall be stile and rail type swing doors equal to Kawneer Series 350 Medium Stile Entrance Door, or approved equal. Aluminum shall be extruded aluminum conforming to ASTM B 221, 0.125 in. thick for door stiles and 0.050 in. thick for glazing molding.
1. Sections shall be of sizes and profiles indicated; shall present straight, sharply defined lines and arises; and shall be free from defects impairing strength, durability, and appearance.
2. Fasteners where exposed shall be aluminum stainless steel or plated steel conforming to ASTM A 164.
3. Door Depth: 2 inch.
4. Stile: 3-1/2 inch wide.
5. Top Rail: 3-1/2 inch wide.
6. Bottom Rail: 10-1/4 inch or as indicated.
7. Frame Thickness: 3/16 inch throughout.

B. FRP entrance doors shall be stile and rail type swing doors equal to Kawneer Flushline FRP Entrance Door; urethane foam-filled door, flush face design, high traffic and high abuse, manufactured by Kawneer, Inc., or approved equal.

1. Aluminum-Framed Flush Entrance Door Core: Shall be urethane foam injected at 2.5 lb./cu. ft. density and shall have “0” O.D.P. = “Zero” Ozone Depletion Potential and contains no Chlorofluorocarbons (CFC’s) or Hydro chlorofluorocarbons (HCFC’s).
2. The door face sheet shall be one of the following as indicated, scheduled, or as selected by the Designer.
   a. Pebble textured fiberglass reinforced polyester (FRP) 0.090” (2.3 mm).
   b. Architectural quality aluminum sheet 0.090” (2.3 mm) thick, embossed or plain unpatterned as selected by Designer.

C. Each door shall be factory glazed set in neoprene glazing gasket.

1. All doors shall be exterior glazed with clear tempered 1 in. thick insulating glass as indicated. Glass shall conform to requirements of Section 088001, GLASS AND GLAZING.
2. Where metal panels are indicated, provide MAPES Insulated Metal Panel, hybrid, abuse resistant interior formed face assembly with smooth painted face sheet and standard exterior smooth face.

2.7 FINISHES

A. Aluminum Finish:

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Face Sheets:

1. Pebble texture (FRP) fiberglass reinforced polyester. Color will be selected by the Designer from manufacturer’s full range.
2. Aluminum: Select one of the finishes previously stated for exposed aluminum from above.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76.2 mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer’s written instructions for installing aluminum-framed storefront and aluminum-framed entrance doors, hardware, accessories, and other components.

B. Install aluminum-framed flush entrance doors and storefront framing in openings prepared under other Sections level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill threshold in bed of sealant, as indicated, for weather tight construction.

D. Provide protection against galvanic action. Isolate dissimilar materials with bituminous coating or non-absorptive dielectric tape.

E. Install entrance doors, door frame, and finish hardware. Carefully fit and adjust doors and hardware to frames and weatherstripping. After erection check and adjust operating hardware for smooth and proper operation.

F. Provide all glazing and metal panel inset into framing.

3.3 PROTECTION AND CLEANING OF ALUMINUM

A. Protect finished metal surfaces from damage during fabrication, shipping, storage, and erection, and from then until acceptance by UMA Project Manager.
B. Clean metal surfaces promptly after installation, exercising care to avoid damage. Remove excess sealant, dirt, and other substances. Lubricate hardware and other moving parts.

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.

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 DESCRIPTION OF WORK

A. Section Includes

1. Furnishing and installation of all mechanical and electrical finish hardware necessary for all doors, and hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware. Installation shall include field modification and preparation of existing doors and/or frames for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

2. Work of this Section includes the following:

   a. New finish hardware (door hardware) as scheduled or as required for new hinged doors.
   b. Reinstallation of salvaged finish hardware as scheduled for all new hinged doors including cleaning and lubricating hardware and assuring that hardware is operating properly and is suitable for the installation.
   c. Providing of new and existing finish hardware templates, as scheduled for all new hinged doors.
   d. Re-installation of salvaged electronic door hardware and associated exit device and card access accessories and components, as scheduled.

B. Alternates: Not Applicable.

C. Items to be Furnished Only: Not Applicable.

D. Items to Be Installed Only: Install the following items as furnished by the designated Sections:
1. Von Duprin exit devices, kits, power supplies and associated exit device card access control and accessories will be furnished by UMA as specified in Section 0101100, SUMMARY OF WORK.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Temporary weather protection and barriers is specified in Section 015000, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
2. Removal of door frames and trim where applicable; Section 024100, SELECTIVE DEMOLITION.
3. Section 062000, FINISH CARPENTRY.
4. Section 084115, ALUMINUM FRAMED ENTRANCES, STOREFRONTS, AND WINDOWS; preparation of new FRP doors, aluminum doors, and aluminum frames for all hardware including continuous hinges and power transfer devices.
5. Section 088001, GLASS AND GLAZING.
6. Division 26 – ELECTRICAL.; Coordination of electrical work and power to electrically operated components.
7. Lead containing paint, glazing, and other materials management is specified in Section 020800, ASBESTOS AND LEAD CONTAINING MATERIALS MANAGEMENT.

1.3 REFERENCES

A. Applicable state and local building codes and standards.

B. Fire/Life Safety

1. NFPA - National Fire Protection Association
   a. NFPA 70 – National Electric Code
   b. NFPA 80 - Standard for Fire Doors and Fire Windows
   d. NFPA 105 - Smoke and Draft Control Door Assemblies

C. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

D. Accessibility

1. ADA - Americans with Disabilities Act
2. Massachusetts Architectural Access Board Regulation – 521 CMR

E. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware

F. ANSI - American National Standards Institute
1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

A. General: Submit the following in accordance with CONDITIONS OF CONTRACT and Division 01 Section “Submittal Procedures” requirements. Prior to submittal field verify existing doors and/or frames receiving new hardware and/or existing conditions receiving new openings. Verify new hardware is compatible with the existing door/frame preparation and/or existing conditions. Advise Designer within the submittal package of incompatibility or issues.

B. Catalog Cuts: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Templates: Provide templates to meet construction schedules and quantities required for door machining.

D. Final Hardware Schedule Content: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening. Include the following information:

1. Door Index; include door number, heading number, and Designers hardware set number.
2. Opening Lock Function Spreadsheet; list locking device and function for each opening.
3. Type, style, function, size, and finish of each hardware item.
4. Name and manufacturer of each item.
5. Fastenings and other pertinent information.
6. Location of each hardware set cross-referenced to indications on Drawings.
7. Explanation of all abbreviations, symbols, and codes contained in schedule.
8. Mounting locations for hardware.
9. Door and frame sizes and materials.
10. Name and phone number for the local manufacturer's representative for each product.
11. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and/or access control components). Operational description should include how the door will operate on egress, ingress, and/or fire/smoke alarm connection.

E. Key Schedule: After a keying meeting between representatives of the Owner, Designer, hardware supplier, and, if requested, the representative for the lock manufacturer, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled. Utilize ANSI A156.28 “Recommended Practices for Keying Systems” as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system.
F. Samples: If requested by the Designer, submit production sample or sample installations as requested of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.

1. Samples will be returned to the supplier in like-new condition. Units that are acceptable to the Designer may, after final check of operations, be incorporated into the Work, within limitations of key coordination requirements.

G. Templates: After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware.

H. Riser and Wiring Diagrams: After final approval of the hardware schedule, submit riser and wiring diagrams as required for the proper installation of complete electrical, electromechanical, and electromagnetic products.

I. Operations and Maintenance Data: Provide in accordance with Division 01 and include the following:

1. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
2. Catalog pages for each product.
3. Name, address, and phone number of local representative for each manufacturer.
4. Parts list for each product.
5. Copy of final approved hardware schedule, edited to reflect “As installed.”
6. Copy of final keying schedule.
7. As installed “Wiring Diagrams” for each opening connected to power, both low voltage and 110 volts.
8. One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
9. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.

J. Certificates of Compliance: Upon request of Designer or Authority Having Jurisdiction certificates of compliance for fire-rated hardware and installation instructions shall be made available.

1.5 QUALITY ASSURANCE

A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials. Requests for substitutions must be made in accordance with Division 01 requirements. If proposing a substitute product, submit product data for the proposed item with product data for the specified item and indicate basis for substitution and savings to be made. Provide sample if requested. Certain products have been selected for their unique characteristics and particular project suitability.

1. Items specified as “no substitute” shall be provided exactly as listed.
2. Items listed with no substitute manufacturers listed have been requested by the Owner or Designer to match existing for continuity and/or future performance and maintenance standards or because there is no known equal product.
3. If no other products are listed in a category, then “no substitute” is implied.
B. Supplier Qualifications: A recognized architectural hardware supplier, with warehousing facilities in the Project’s vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides a certified Architectural Hardware Consultant (AHC) available to the Owner, Designer, and Contractor, at reasonable times during the course of the Work for consultation.

C. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, exit devices, closers, etc.) from a single manufacturer.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

E. Electronic Security Hardware: When electrified hardware is included in the hardware specification, the hardware supplier must employ an individual knowledgeable in electrified components and systems, who is capable of producing wiring diagrams and consulting as needed. Coordinate installation of the electronic security hardware with the Designer and electrical engineers and provide installation and technical data to the Designer and other related subcontractors. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Tag each item or package separately with identification related to the final hardware schedule, and include installation instructions with each item or package.

B. Each article of hardware shall be individually packaged in manufacturer’s original packaging.

C. Contractor will provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Items damaged in shipment shall be replaced promptly and with proper material and paid for by whomever did the damage or caused the damage to occur.

E. Hardware shall be handled in a manner to avoid damage, marring, or scratching. Irregularities that occur to the hardware after it has been delivered to the Project shall be corrected, replaced, or repaired by the Contractor. Hardware shall be protected against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. No direct shipments will be allowed unless approved by the Contractor.

1.7 WARRANTY

A. Provide manufacturer’s warranties as specified in Division 01 and as follows:

1. Closers: 10 years, except electronic closers, 2 years.
2. Exit Devices: 3 years, except electrified devices, 1 year.
3. Locksets: 3 years, except electrified locksets, 1 year.
4. Other hardware: 1 year.

B. No liability is to be assumed where damage or faulty operation is due to improper installation, improper use, or abuse.

C. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer’s warranty, at no additional cost to the Owner.

1.8 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner’s continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Awarding Authority has determined that certain products should be selected for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute” [NO OTHER PRODUCTS WILL BE CONSIDERED FOR THOSE LISTED IN PROJECTS DOCUMENTS.]

B. Approval of manufacturers other than those listed shall be in accordance with Paragraph 1.5.A.

C. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

<table>
<thead>
<tr>
<th>Item</th>
<th>Scheduled Manufacturer</th>
<th>Acceptable Substitute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Hinges</td>
<td>Ives (IVE)</td>
<td>Hager, McKinney, Stanley</td>
</tr>
<tr>
<td>Electric Power Transfer</td>
<td>Von Duprin (VON)</td>
<td>No Substitute</td>
</tr>
<tr>
<td>Flush Bolts</td>
<td>Ives (IVE)</td>
<td>Burns, Rockwood</td>
</tr>
<tr>
<td>Mortise Locksets</td>
<td>Schlage (SCH)</td>
<td>No Substitute</td>
</tr>
<tr>
<td>Exit Devices</td>
<td>Von Duprin (VON)</td>
<td>No Substitute</td>
</tr>
<tr>
<td>Power Supplies</td>
<td>Von Duprin (VON)</td>
<td>No Substitute</td>
</tr>
<tr>
<td>Door Closers</td>
<td>Sargent (SAR)</td>
<td>No Substitute</td>
</tr>
<tr>
<td>Door Trim</td>
<td>Ives (IVE)</td>
<td>Burns, Rockwood</td>
</tr>
<tr>
<td>Protection Plates</td>
<td>Ives (IVE)</td>
<td>Burns, Rockwood</td>
</tr>
<tr>
<td>Overhead Stops</td>
<td>Glynn-Johnson (GLY)</td>
<td>Rixson, Sargent</td>
</tr>
<tr>
<td>Stops &amp; Holders</td>
<td>Ives (IVE)</td>
<td>Burns, Rockwood</td>
</tr>
<tr>
<td>Thresholds &amp; Weatherstrip</td>
<td>National Guard (NGP)</td>
<td>Reese, Zero</td>
</tr>
<tr>
<td>Silencers</td>
<td>Ives (IVE)</td>
<td>Burns, Rockwood</td>
</tr>
<tr>
<td>Cylinders &amp; Keying</td>
<td>Supplied by UMA</td>
<td></td>
</tr>
</tbody>
</table>
D.   Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

E.   Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Designer's approval.

2.2 MATERIALS

A.   Fasteners

1.   Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.

2.   Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

3.   Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Review door specification and advise Designer if thru-bolts are required.

4.   Hardware shall be installed with the fasteners provided by the hardware manufacturer.

B.   Continuous Hinges

1.   Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 2.

2.   Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with .25 inch diameter Teflon coated stainless steel hinge pin.

3.   Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.

4.   Hinges shall be capable of supporting door weights up to 450 pounds, and shall be successfully tested for 1,500,000 cycles.

5.   On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by a testing agency acceptable to the authority having jurisdiction.

6.   Provide aluminum geared continuous hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware.

7.   Install hinges with fasteners supplied by manufacturer. Hole pattern shall be symmetrically patterned.

8.   Acceptable manufacturers and/or products: Ives, Roton, Stanley.

C.   Electric Power Transfer

1.   Provide power transfer sufficient for number and gage of wires to accommodate electric function of specified hardware.
2. Electric power transfer is to be located per manufacturer’s template and UL requirements, unless interference with operation of door or other hardware items.

3. Acceptable manufacturers and/or products: Von Duprin, No Substitute.

D. Flush Bolts

1. Provide automatic and manual flush bolts with forged bronze face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. Top rods at manual flush bolts for doors over 90 inches in height shall be increased by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.

2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

E. Mortise Locks

1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing without opening the case. Cylinders: Refer to 2.4 KEYING.

2. Provide locks with a standard 2-3/4 inches backset with a full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1 inch throw, constructed of stainless steel.

3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.

4. Provide electrical options as scheduled. Provide electrified locksets with micro switch (RX) option that monitors the retractor crank, and is actuated when rotation of the inside or outside lever rotates the retractor hub. Provide normally closed contacts or normally open contacts as required by security system.

5. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle.

   a. Lever design shall be Schlage 06A.
   b. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.


F. Exit Devices

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware. Cylinders: Refer to 2.4 KEYING.

2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.

3. Exit devices shall incorporate a fluid damper or other device that eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width, but not the full length of the exit device rail. End-cap will have two-point attachment to door. Touch-pad shall match exit device finish, and shall be stainless steel for US26, US26D, US28, US32, and US32D finishes; for all other finishes, the touch-pad finish shall be of compatible finish to exit device. Only compression springs will be used in devices, latches, and outside trims or controls.
4. Devices to incorporate a deadlatching feature for security and/or for future addition of alarm kits and/or other electrical requirements.

5. Vertical rod devices shall be capable of being field modified to less bottom rod devices by removal of bottom rod and adding firing pin(s), if required at fire rated openings.

6. Provide manufacturer's standard strikes.

7. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Designer.

8. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.

9. Non-fire-rated exit devices shall have cylinder dogging.

10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

  a. Lever style will match the lever style of the locksets.
  b. Lever trim on doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.

11. Exit devices for fire rated openings shall be UL labeled fire exit hardware.

12. Provide electrical options as scheduled.


G. Power Supplies

1. Provide power supplies, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.

2. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking component and/or components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component utilizing the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Designer.

3. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.

4. Provide a power supply complete requiring only 120VAC to the fused input and shall be supplied in an enclosure.

5. Provide a power supply with emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating "no delay" exiting mode.

6. Acceptable manufacturers and/or products: Von Duprin PS800 series, No Substitute.

H. Door Closers

1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
2. Door closers shall have fully hydraulic, full rack and pinion action with an aluminum cylinder. Closer body shall be 1-1/2 inch diameter, and heat-treated pinion journal shall be 11/16 inch diameter.

3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to 10 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C “positive pressure” fire test.

4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.

5. Delayed action feature shall be included and controlled by a separate valve. Delayed action shall be in addition to, not in lieu of, backcheck.

6. An increase of 15% in closing power shall be provided by means of adjustment of the arm leverage at the foot connection. (Standard arm)


8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other finish hardware items interfering with closer mounting.

9. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Designer.

10. Closer bodies shall have a 10 year limited warranty.

11. Door closers meeting this specification: Sargent 351 Powerglide, No Substitute.

I. Door Trim

1. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.

2. Provide flush pulls as specified. Where required, provide back-to-back mounted model.

3. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.

4. Provide pull plates 6 inches wide x 16 inches high x 0.050 inch thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 6 inches wide plate, adjust width to fit.

5. Provide wire pulls of solid bar stock, diameter and length as scheduled.

6. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

J. Protection Plates

1. Provide kick plates, minimum of 0.050 inch thick as scheduled. Furnish with machine or wood screws, finished to match plates. Sizes of plates shall be 10 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs.

2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

K. Thresholds, Seals, Door Sweeps, Door Bottoms, and Gasketing

1. Provide thresholds, weatherstripping including door sweeps, seals, astragals and gasketing systems as specified and per architectural details. Match finish of other items as closely as possible. Size of thresholds shall be as follows:
2. Provide door sweeps, seals and astragals only of type where resilient or flexible seal strip is easily replaceable and readily available.

3. Acceptable manufacturers and/or products: National Guard, Reese, Zero.

L. Silencers

1. Provide "Push-in" type silencers for each hollow metal or wood frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.

2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

2.3 FINISHES

A. Finish of all hardware shall match existing finish for each location.

2.4 KEYING

A. The University of Massachusetts will provide all cylinder housings and permanent cores for installation in locks and exit devices by the Contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of finish hardware. Correct all defects prior to proceeding with installation.

3.2 INSTALLATION

A. Coordination:

1. Prior to installation of hardware, schedule and hold a meeting for the purpose of instructing installers on proper installation and adjustment of finish hardware. Representatives of locks, exit devices, closers, automatic operators, and electrified hardware shall conduct training; provide at least 10 days notice to representatives. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Designer.

2. Prior to ordering electrified hardware, schedule and hold a meeting for the purpose of coordinating finish hardware with security, electrical, doors and frames, and other related suppliers. A representative of the supplier of finish hardware, and doors and frames, the electrical subcontractor, and the Owner's security contractor shall meet with the Owner, Designer, and General Contractor prior to ordering finish hardware. After meeting a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Designer.
B. Hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer's rep for the item in question, as listed in the hardware schedule.

C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.

D. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.

E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.

F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

G. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

H. Existing Doors and/or Frames: Remove existing hardware being replaced, tag, and store according to contract documents. Field modify and prepare existing door and/or frame for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

I. Wire (including low voltage), conduit, junction boxes, and pulling of wire is by Division 26 - ELECTRICAL. Electrical Contractor shall connect wire to door position switches and run wire to central room or area as directed by the Designer. Wires shall be tested and labeled with the Designer’s opening number. Connections to/from power supplies to electrified hardware and any connection to fire/smoke alarm system, and/or smoke evacuation system where specified is by Division 26 - ELECTRICAL.

3.3 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Clean adjacent surfaces soiled by hardware installation.

D. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.
3.4 FIELD QUALITY CONTROL

A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of locks, exit devices, closer, and any electrified hardware, shall perform the following work:

1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
2. Consult with and instruct Owner’s personnel in recommended additions to the maintenance procedures.
3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
4. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.
5. At completion of project, a qualified factory representative for the manufacturers of locksets, closer, exit devices, and access control products shall arrange and hold a training session to instruct the Owner's personnel on the proper maintenance, adjustment, and/or operation of their respective products. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Designer.

3.5 PROTECTION

A. Provide for the proper protection of complete items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

3.6 HARDWARE SCHEDULE

A. HW SET: 01 (New EL Panic Device - Special Dogging)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Transfer</td>
<td>1</td>
<td>EPT-10</td>
</tr>
<tr>
<td>Panic Hardware</td>
<td>1</td>
<td>LX-RX-LC-SD-EL99NL-OP (Supplied by UMass)</td>
</tr>
<tr>
<td>Cylinder</td>
<td>1</td>
<td>MORTISE (Supplied by UMass)</td>
</tr>
<tr>
<td>Cylinder</td>
<td>1</td>
<td>RIM (Supplied by UMass)</td>
</tr>
<tr>
<td>Offset Door Pull</td>
<td>1</td>
<td>8190-0</td>
</tr>
<tr>
<td>Pull Plate</td>
<td>1</td>
<td>8300 X 6” X 16” X PREP FOR 8190-0 AND CYL IF REQ.</td>
</tr>
<tr>
<td>Power Supply</td>
<td>1</td>
<td>PS873-2 (Supplied by UMass)</td>
</tr>
<tr>
<td>Door Position Switch</td>
<td>1</td>
<td>1078C (Supplied by Security Integrator)</td>
</tr>
<tr>
<td>Card Reader</td>
<td>1</td>
<td>(Supplied by Security Integrator)</td>
</tr>
</tbody>
</table>

B. HW SET: 02 (New EL Panic Device - Special Dogging - Aux. Alarm)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Supplier/Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 EA</td>
<td>Power Transfer</td>
<td>EPT-10</td>
<td>VON</td>
</tr>
<tr>
<td>1 EA</td>
<td>Panic Hardware</td>
<td>LX-RX-LC-SD-EL99NL-OP (Supplied by UMass)</td>
<td>VON</td>
</tr>
<tr>
<td>1 EA</td>
<td>Cylinder</td>
<td>MORTISE (Supplied by UMass)</td>
<td>SCH</td>
</tr>
<tr>
<td>1 EA</td>
<td>Cylinder</td>
<td>RIM (Supplied by UMass)</td>
<td>SCH</td>
</tr>
<tr>
<td>1 EA</td>
<td>Offset Door Pull</td>
<td>8190-0</td>
<td>IVE</td>
</tr>
<tr>
<td>1 EA</td>
<td>Pull Plate</td>
<td>8300 X 6&quot; X 16&quot; X PREP FOR 8190-0</td>
<td>IVE</td>
</tr>
<tr>
<td>1 EA</td>
<td>Power Supply</td>
<td>PS873-2 (Supplied by UMass)</td>
<td>VON</td>
</tr>
<tr>
<td>1 EA</td>
<td>Aux. Local Alarm</td>
<td>(Supplied by Security Integrator)</td>
<td></td>
</tr>
<tr>
<td>1 EA</td>
<td>Door Position Switch</td>
<td>1078C (Supplied by Security Integrator)</td>
<td>SEN</td>
</tr>
<tr>
<td>2 EA</td>
<td>Card Reader</td>
<td>(Supplied by Security Integrator)</td>
<td></td>
</tr>
</tbody>
</table>


C. HW SET: 03 (New ALK Panic Device)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Supplier/Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 EA</td>
<td>Power Transfer</td>
<td>EPT-10</td>
<td>VON</td>
</tr>
<tr>
<td>1 EA</td>
<td>Panic Hardware</td>
<td>LX-RX-LC-SD99NL-OP X ALK (Supplied by UMass)</td>
<td>VON</td>
</tr>
<tr>
<td>2 EA</td>
<td>Cylinder</td>
<td>MORTISE (Supplied by UMass)</td>
<td>SCH</td>
</tr>
<tr>
<td>1 EA</td>
<td>Cylinder</td>
<td>RIM (Supplied by UMass)</td>
<td>SCH</td>
</tr>
<tr>
<td>1 EA</td>
<td>Offset Door Pull</td>
<td>8190-0</td>
<td>IVE</td>
</tr>
<tr>
<td>1 EA</td>
<td>Pull Plate</td>
<td>8300 X 6&quot; X 16&quot; X PREP FOR 8190-0</td>
<td>IVE</td>
</tr>
<tr>
<td>1 EA</td>
<td>Power Supply</td>
<td>PS9 (Supplied by UMass)</td>
<td>VON</td>
</tr>
<tr>
<td>1 EA</td>
<td>Door Position Switch</td>
<td>1078C (Supplied by Security Integrator)</td>
<td>SEN</td>
</tr>
</tbody>
</table>

ALK Kit to Be Supplied with Self-Reset Feature after 1 1/2 Minutes.

D. HW SET: 04 (New Best Lock)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Supplier/Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 EA</td>
<td>Storeroom Lock</td>
<td>93K7D 15D S3 (Supplied by UMass) X 626</td>
<td>BES</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 088001
GLASS AND GLAZING

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS including AGREEMENT and CONDITIONS OF THE CONTRACT and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Trade Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority, the University of Massachusetts Amherst (UMA), at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

Name of Sub-Bidder: ________________________________
(Insert name of sub-bidder)

UMA Contract Name: UNIVERSITY OF MASSACHUSETTS AMHERST (UMASS AMHERST) SOUTHWEST TOWER ENTRY VESTIBULE AND LOWRISE LOUNGE IMPROVEMENTS

UMA Contract No: UMA 17-05

UMA Project No. 15-1004683

Sub-Bid for Section: SECTION 088001 – GLASS AND GLAZING

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended.

3. Sub-bids filed with 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 Commonwealth 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:

1. Sub bidder’s attention is directed to Massachusetts G.L. Chapter 149 Section 44F, as amended, which provides in part as follows:

2. Each sub-bidder shall list in Paragraph E of the “Form for Sub-bid” the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub trade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

CLASSES OF WORK

REFERENCE

[Not Applicable / No Sub Sub-Bids Required]

3. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

b. Mechanical (M-Series) Drawings: Drawings M1.01 through M1.02.
c. Electrical (E-Series) Drawings: Drawings E1.01.

1.2 DESCRIPTION OF WORK

A. Furnish and install glass and glazing, as indicated on Drawings and as specified herein. Include, but do not limit to glass and glazing for the following:

1. Exterior storefront and entrances.
2. Interior aluminum storefront.
3. Interior doors and sidelights, interior windows, and borrowed lights to receive glass.
4. All other glass and glazing called for, or reasonably inferred from the Drawings.
5. Staging, Planking and Scaffolding: The Glass and Glazing Subcontractor shall furnish, install and maintain in safe and adequate condition, all staging, planking and scaffolding up to eight feet (8 ft.) in height that is necessary for the proper execution of the Work in this Section. The General Contractor shall furnish, install and maintain in safe and adequate condition all staging, planking and scaffolding above eight feet (8 ft.) in height.

B. Alternates: Not Applicable.

C. Items to be Furnished Only: Not Applicable.

D. Items to Be Installed Only: Install the following items as furnished by the designated Sections:
1. TBD.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 024100, SELECTIVE DEMOLITION.
2. Section 039030, CONCRETE REPAIR: Patching of concrete surfaces which have spalled, chipped or broken as a result of the coring.
3. Section 084115, ALUMINUM FRAMED ENTRANCES, STOREFRONTS, AND WINDOWS; Aluminum framing for storefront including aluminum entrance doors and factory-glazed windows.

F. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete finished installation.

G. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda, and Change Orders, all of which are part of Contract Documents.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Initial Selection Samples: Submit samples of each glass and glazing material showing complete range of colors, textures, and finishes available for each material used.

C. Verification Samples: Submit representative samples of each glass and glazing material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide glass samples having minimum size of 144 sq. in. and 6 in. long samples of sealants and glazing materials.

D. Calculations: Provide glass manufacturer's wind load charts, calculations and certification of performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied.

E. Test Reports: Provide certified reports for specified tests.
1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
   a. Specified Design Wind Loads: As specified in Section 084115.
   b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
   c. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120°F (67°C), ambient; 180°F (100°C), material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
   2. For insulating-glass units, properties are based on units 1-inch thick for overall unit and for each lite 6.0 mm thick and a nominal 1/2-inch- (12.7-mm-) wide interspace.
   3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
      a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).

1.5 QUALITY ASSURANCE

A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.
B. Installer: A firm with a minimum of three years’ experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.

1.6 TESTS

A. Fire Resistance Rated Glass: Provide products which have been tested in compliance with ASTM E 152 and ASTM E 163, UL-listed, and acceptable to local authorities having jurisdiction and which are labeled or listed by independent agencies acceptable to Designer. Glass shall conform to Massachusetts State Building Code.

B. Preconstruction Sealant Test: Submit samples of materials to be used to glazing sealant manufacturer to determine sealant compatibility. Include samples of glass, gaskets, glazing materials, framing members, and other components and accessories of glazing work. Test in accordance with ASTM C 794 to verify what type of primers (if any) are required to ensure sealant adhesion to substrates.

1. Submit minimum of nine pieces of each type and finish of framing member, and nine pieces of each type, class, kind, condition, and form of glass, including monolithic, laminated, and insulating glass for adhesion tests.

2. Provide manufacturer’s written report and recommendations regarding proper sealant choice and use.

1.7 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within limits established by manufacturers of materials and products used.

B. Temperature Limits: Install sealants only when temperatures are within limits recommended by sealant manufacturer, except, never install sealants when temperatures are below 40°F.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer’s instructions and recommendations and GANA Manual.

1. Protect materials from moisture, sunlight, excess heat, sparks and flame.

2. Sequence deliveries to avoid delays, but minimize on-site storage.

1.9 COORDINATION

A. Work under this section shall be properly coordinated with the work of other sections to assure the steady progress of all the work of the Contract.
1.10  WARRANTY

A.  Provide a written warranty, signed by the manufacturer, installer, and Contractor, agreeing to repair or replace work which exhibits defects in materials or workmanship. "Defects" is defined to include, but not limited to, leakage of water, abnormal aging or deterioration, failure of hermetic seals, edge separation or delamination of laminated glass, peeling, cracking, or crazing of metallic coatings, and failure to perform as required. Include requirement for removal and replacement of covering and connected adjacent work. Provide warranty periods standard with the manufacturer.

B.  Manufacturer's Special Project Warranty on Insulating Glass:

1. Provide written warranty signed by manufacturer of insulating glass agreeing to furnish FOB point of manufacture, freight allowed Project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects.
2. Manufacturing defects are defined as failure of hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during warranty period.
3. Warranty Period: Manufacturer's standard minimum 10 years after date of Substantial Completion.
4. This warranty shall be in addition to and not limitation of other rights Owner may have against Contractor under Contract Documents.

PART 2 - PRODUCTS

2.1  ACCEPTABLE MANUFACTURERS/FABRICATORS

A.  Glass:  Provide glass products of one of the following manufacturers/fabricators that meet or exceed the requirements of these specifications:

1.  Falcomer Glass Industries.
2.  Guardian Industries.
3.  Pilkinton / LOF.
4.  PPG Industries.
5.  Viracon, Inc.

2.2  GLASS MATERIALS AND PRODUCTS

A.  Clear Float Glass: ASTM C 1036, Type I-Transparent, Flat, Class 1-Clear, Quality q3.

B.  Clear Heat Strengthened Glass: ASTM C 1048, Condition A-Uncoated, Type I-Transparent, Flat, Class 1-Clear, Quality q3, Kind HS.

C.  Clear Tempered Safety Glass: ASTM C 1048, Condition A-Uncoated, Type I - Transparent, Flat, Class 1-Clear, Quality q3, Kind FT, complying with ANSI Z97.1. Thickness 1/4 in. unless otherwise indicated as required.
D. Laminated Safety Glass: Provide two glass panes of equal thickness, laminated together with a polyvinyl butyl interlayer, conforming to ASM C 1172, and as follows:

1. Interlayer Color: Clear.
2. Interlayer Material: Provide Monsanto "Saflex" or DuPont "Butacite", 0.030 in. thick at vertical applications.

E. Custom, Decorative Glazing (Opaque): Provide opaque glass where indicated; glass shall match Designer's sample. Opaque glass may be one of the following:

1. Sandblasted clear glass to remove to achieve an obscure appearance to match Designer's sample. Sandblasted glass shall be treated with a polymer type coating to protect the surface from finger and handling marks.
2. Laminated glass with integral opaque film to provide obscure glazing.

F. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article. Where required by Code, provide tempered glass panes.
2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
4. Spacer Specifications: Aluminum space, with mill or clear anodic finish. Provide manufacturer's standard corner construction.
5. Performance:

   a. Interspace Content: Air or argon, as standard with manufacturer.
   b. Outdoor Lite: Class 1 (clear).
   c. Low-E Coating: Pyrolytic or sputter-coated Low-E coating on second or third surface.
   d. Indoor Lite: Class 1 (clear).
   e. Performance: (Basis of specification is Guardian SunGuard Coating AG 43 High Performance Low E).

   Visible light transmittance: 41%.
   Solar transmittance: 24%.
   U-V transmittance: 23%.
   Winter Nighttime U-value: 0.31 Btu/hour x sq. ft x deg. F.
   Summer Daytime U-value: 0.30 Btu/hour x sq. ft x deg. F.
   Solar Heat Gain Coefficient: 0.29 maximum.
   Shading Coefficient: 0.33.
G. Spandrel, Insulating-Glass Units: (to be selected by Designer)
   1. Overall Unit Thickness and Thickness of Each Lite: 1 inch (25 mm) thickness overall
      and 0.25 inch (6.0 mm) thickness of each of two panes with 0.50 inch (12.0 mm) air
      space, unless otherwise indicated in the glazing schedule at the end of this Section.
   2. Outdoor Lite: To match vision glass.
   3. Ceramic Coating: Ceramic frit coating on #4 surface.

H. Fire Rated Glazing:
   1. All glass designated on the Drawings as fire-rated and impact safety-rated shall be
      3/16 inch (5 mm) thick FireLite NT supplied by Technical Glass Products. The surface
      condition shall be Premium FireLite NT (polished surfaces).

2.4 GLAZING MATERIALS AND PRODUCTS

A. General: Provide sealants and gaskets with performance characteristics suitable for
   applications indicated. Ensure compatibility of glazing sealants with laminated glass in-
   terlayers, plastic glazing, and with any other surfaces in contact.

B. General Glazing and Cap Bead Sealant: Provide sealant with maximum Shore A hardness of 50. Provide one of the following:
   1. Dow Corning 795.
   2. General Electric Silglaze N 2500 or Contractors SCS-1000.
   3. Tremco Proglaze.

C. Weather Seal Sealant: Provide non-acid curing sealant with movement range ±50%,
   ASTM C 719. Provide one of the following:
   1. Dow Corning 795.
   2. General Electric Silpruf.
   3. Tremco Spectrum 2.

D. Dense Elastomeric Compression Seal Gaskets: Provide molded or extruded neoprene
   or EPDM gaskets, Shore A hardness of 75±5 for hollow profile, and 60±5 for solid profiles,
   ASTM C 864.

E. Cellular, Elastomeric Preformed Gaskets: Provide extruded or molded closed cell, inte-
   gral-skinned neoprene, Shore A 40±5, and 20% to 35% compression, ASTM C 509.

F. Preformed Glazing Tape: Provide solvent-free butyl-polyisobutylene rubber with 100%
   solids content complying with AAMA A 804.1. Provide preformed glazing tape in ex-
   truded tape form. Provide one of the following:
   1. Protective Treatments 303 or 606.
   2. Tremco Preshimmed 440.
G. Setting Blocks: Provide neoprene or silicone blocks with Shore A hardness of 80-90. Provide products certified by manufacturer to be compatible with silicone sealants.

   1. Shims: For shims used with setting blocks, provide same materials, hardness, length and width as setting blocks.

H. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of 55±5.

I. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.

PART 3 - EXECUTION

3.1 INSPECTION

   A. The Installer/Glazier shall examine substrates, supports, and conditions under which this work is to be performed. Notify Contractor in writing, outlining conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning of installation will be construed as glazier accepting substrates and conditions.

3.2 INSTALLATION

   A. General Installation Requirements: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section. Comply with GANA Manual.

       1. Prior to installing glass, clean glazing channels and framing members.
       2. Remove coatings not completely bonded to substrates.
       3. Remove lacquer from metal surfaces where in contact with sealants.
       4. Protect glass from edge damage at all times. Use roller blocks and suction cups.
       5. Replace glass with edge damage or other imperfections which could weaken glass.
       6. Install setting and side blocks in locations recommended by referenced standards, and as required to prevent glass displacement.
       7. Center glass in openings. Provide 1/2 in. minimum glass bite and 1/8 in. edge clearances.
       8. Install glass and glazing in such a manner as to allow for easy replacement of glass and glazing without dismantling of frames.
       9. Install glazing tapes and gaskets.
      10. Prevent metal to glass contact at all times. Protect edges of insulated units from moisture and solvents.
      11. Clean, prime, and install stops.
      12. Cap seal exterior joints between glazing and framing with a uniform fillet of clear, silicone sealant. Slope cap seal from glass to framing. Provide maximum 1/16 in. clearance between top of frame and top of cap seal.

   B. Install fire rated glazing per manufacturer’s printed instructions.
3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces using manufacturer recommended materials and methods. Remove and replace work which cannot be successfully cleaned. Clean glass and framing members frequently to protect from build-up of harmful construction contaminants.

B. Touch-up damaged coatings and finishes. Eliminate visible evidence of repair.

C. Re-clean glass within one week of final acceptance.

D. Provide temporary protection at all times during course of work, and immediately after completion to ensure work of this Section is not damaged or deteriorated in any way at time of final acceptance. Remove temporary protections and reclean as necessary immediately prior to final acceptance.

E. Remove and replace broken, chipped, cracked, or otherwise damaged glass.

END OF SECTION
SECTION 093000

TILING

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 SUMMARY

A. Provide all labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Preparation of tile substrates for installation of slate tile.
2. Furnishing and installing stainless steel edge trim at tile flooring including perimeter edge trim at entrance mat.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 035410, CEMENTITIOUS UNDERLAYMENT for cementitious underlayment.
2. Section 124813, ENTRANCE FLOOR MATS for entrance mat installation.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.

1.5 SUBMITTALS

A. Refer to Division 01 Section Submittal Procedures for administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples and other miscellaneous submittals.
B. Product Data: For each type of product indicated.

C. Samples for Initial Selection: For each type of grout indicated. Include Samples of accessories involving color selection.

D. Qualification Data: For qualified Installer.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.6 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards contained in American National Standard Specifications for Installation of Ceramic Tile and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

1.7 QUALITY ASSURANCE

A. Source Limitations:

1. Obtain ingredients of a uniform quality for each mortar, adhesive and grout component from one manufacturer and each aggregate from one source or producer.

B. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover and in a dry location.

C. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer’s written instructions.
PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules and other requirements specified.

2.2 SLATE TILE – OWNER-FURNISHED

A. Slate Tile to be furnished by the Owner for installation under the work of this Section.

2.3 WATERPROOF MEMBRANES (Where Required)

A. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, SBS-modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.

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. National Applied Construction Products, Inc.: Strataflex OR


1. Products: Subject to compliance with requirements, provide one of the following:

   b. Bonsal American, an Oldcastle company: B 6000 Waterproof-Crack Isolation Membrane with B 6000 Mesh.
   c. Bostik, Inc.; Hydroment Blacktop 90210.
   e. MAPEI Corporation: Mapelastic HPG with MAPEI Fiberglass Mesh.

2.4 SETTING MATERIALS


1. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

2. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Boiardi Products Corporation; a QEP company.
   b. Bonsal American; an Oldcastle company.
   c. Laticrete International, Inc.
   d. MAPEI Corporation.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Boiardi Products; a QEP company.
      b. Bonsal American; an Oldcastle company.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.
   2. Prepackaged, dry-mortar mix combined with liquid-latex additive.
   3. For wall applications, provide nonsagging mortar.

C. Metal Edge Strips: Metal edge trim for edge protection of tile (slate) flooring and for transition of tile (slate) flooring to entrance mat shall be equal to those manufactured by Schluter Systems L.P., Plattsburgh, NY 12901.
   1. Provide strips of width necessary to set on subbase and be flush with top of tile.
   2. Provide edge strips with integral provisions for anchorage to concrete subbase or mortar bed.
   3. Provide 1/8 in. thick, stainless steel edge strip for protection of tile edges where indicated.
   4. All edge trim and transitions shall comply with current ADA and "barrier-free" regulations.

2.5 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Boiardi Products; a QEP company.
      b. Bonsal American; an Oldcastle company.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.

2.6 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section Joint Sealants.
1. Use primers, backer rods and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

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. Dow Corning Corporation: Dow Corning 786.
   b. GE Silicones; a division of GE Specialty Materials: Sanitary 1700.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

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. Bonsal American; an Oldcastle company: Grout Sealer.
   b. MAPEI Corporation: Silicone Spray Sealer for Cementitious Tile Grout
   c. Southern Grouts & Mortars, Inc.: Silicone Grout Sealer.

C. Water for Mixing: Potable water.

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions where tile will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work and similar items located in or behind tile has been completed.

3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Designer.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes and depressions in substrates for tile floors installed with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

C. Protective Metal Edge Strips and Edge Trim: Install all protective stainless steel edge strips and stainless steel edge trim in accordance with edge trim manufacturer's recommendations. Include stainless steel perimeter trim at entrance mat.

3.3 TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so plates, collars, or covers overlap tile.
D. Provide manufacturer’s standard trim shapes where detailed and all other locations necessary to eliminate exposed tile edges.

E. Jointing Pattern: Match existing tile patterns as directed by Designer and Owner or as indicated on the Drawings. Provide uniform joint widths unless otherwise indicated.

1. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   a. Ceramic Mosaic Tile: 1/4 inch unless otherwise recommended by tile manufacturer.

F. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer’s written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer’s written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.5 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Slate Tile: Tile installation thickset mortar; TCNA F121.

1. Tile Type: Slate Tile (furnished by Owner).
2. Waterproof Membrane: As specified above.
B. Interior Floor Installations, Slate Tile: Tile installation thinset mortar; with waterproof membrane TCNA F122 or TCNA F122A.

1. Tile Type: Slate Tile (furnished by Owner).
2. Waterproof Membrane: As specified above.

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 all labor, materials and equipment necessary to complete the work of this Section including but not limited to the following:
      1. Installation of resilient base.
      2. Resilient base adhesive shall be provided by the contractor.

   B. Alternates: None.

   C. Items To Be Installed Only: Resilient Base.

   D. Items To Be Furnished Only: None.

   E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
      1. Division 2 Section Demolition for removal of existing wall base.

1.3 SUBMITTALS

   A. Product Data: Submit manufacturer's technical data for each type of adhesive.

   B. Manufacturer's installation instructions for wall base.

1.4 QUALITY ASSURANCE

   A. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

   B. Fire-Test-Response Characteristics:
      1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm. according to ASTM E 648 or NFPA 253.
      2. Smoke Developed: 450 or less according to ASTM E 662.
1.5 DELIVERY, STORAGE, AND HANDLING

A. Store wall base and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

A. Provide temporary protection of installed wall base for 48 hours after installation.

1.7 WARRANTY

A. Resilient base shall be provided with the installer’s 1 year warranty against defects in workmanship and installation.

PART 2 - PRODUCTS

2.1 BASE MATERIAL SUPPLIED BY OWNER

A. Wall base materials shall be provided by the University.

2.2 WALL BASE MATERIALS

A. Wall base shall be 1/8 in. thick, 6 in. high, unless otherwise indicated, wall base with a matte finish, conforming to ASTM F 1861, Type TV - Vinyl, Thermoplastic Group 1 - Solid.

2.3 INSTALLATION MATERIALS

A. General: All installation materials shall be low odor and low VOC.

B. Trowelable Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

C. Wall Base Adhesives: Water-resistant type recommended by flooring manufacturer to suit substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Bag and remove from building all removed materials and debris to be removed from site at end of work period.

B. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

C. Fill cracks, holes, and depressions in substrates with patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install wall base until it is the same temperature as space where it is to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. General: Install resilient base in toe space and on ends of casework and on walls in recesses between casework for equipment according to manufacturer's written installation instructions.
   1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
   2. Cope wall base to height of toe space as required. Install wall base full height on ends of casework and walls.
   3. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
   4. Do not stretch base during installation.
   5. Install premolded outside corners before installing straight pieces.
   6. Form outside corners from straight pieces of maximum lengths possible, without whitening at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
   7. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Protect wall base products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096550
SECTION 096900

CARPET TILE

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 SUMMARY

A. The work of this Section consists of installing all Owner-furnished carpet tile (modular carpet) and related items to complete the work as shown on the Drawings and as specified herein and includes, but is not limited to, the following:

1. Preparation of concrete floor slabs and fills, except leveling and repair of faulty surfaces and those not constructed to stated tolerance.
2. Installation of Owner-furnished carpet tile at floor areas scheduled to receive carpet tile.
3. Return to Owner (UMA) any carpet tile not used for the installation.

B. Items To Be Installed Only: Carpet Tile.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 096550, RESILIENT WALL BASE for vinyl wall base.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.
1.5 QUALITY ASSURANCE

A. Carpet tile installation shall be done only by an installer approved by carpet tile manufacturer, and having not less than five years’ experience on similar installations and employing only experienced carpet tile layers skilled in this work, and must be able to list for Designer’s inspection at least two (2) complete installations by him, containing not less than 2,500 square yards of carpet tile each in completed buildings reasonably near the site. Such completed carpet tile installations shall have been done with materials and methods similar to those required for work under this Section.

B. Installer Qualifications: Engage an experienced Installer who is certified by the Floor Covering Installation Board (FCIB) or who can demonstrate compliance with FCIB certification program requirements.

C. VOC Content Requirements: All adhesives, adhesive bonding primers, or adhesive primers must not exceed the VOC Content requirements of the following:

1. South Coast Air Quality Management District (SCAQMD) Rule #1168.

1.6 STANDARDS AND CERTIFICATION

A. Notwithstanding anything else in this Specification to the contrary, including specific product descriptions, the entire carpet tile installation, including all materials used therein, shall conform to (1) all requirements of the applicable laws and building code regarding fire hazard classification ratings (flame spread, fuel contributed, and smoke developed), and (2) FHA “Use of materials Bulletin No. UM-44b” for maximum wear (heavy traffic) areas (although FHA standards are not otherwise applicable to this Contract).

1. Fire Hazard Classification: Comply with UL Class B (flame spread 75 or less).

B. Carpet Testing Program Label.

C. Carpet and carpeting materials shall meet or exceed the fire hazard requirements of the State of Massachusetts fire marshal, and authorities having jurisdiction.


1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 5: "Storage and Handling."

B. Promptly remove all materials not complying with these specifications or with the legal requirements of authorities having jurisdiction, and replace same with materials which do comply, all as directed by, or subject to the approval of, the Designer.
C. Deliver materials to Project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.

D. Store materials on-site in original undamaged packages, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, with continuous blocking off ground.

1.8 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6: "Site Conditions."

B. Space Enclosure and Environmental Limitations: Do not install carpet tile until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

C. Subfloor Moisture Conditions: Moisture emission rate of not more than 3 lb./1000 sq. ft./24 hours (14.6 kg/1000 sq. m/24 hours) when tested by calcium chloride moisture test in compliance with CRI 104, 6.2.1, with subfloor temperatures not less than 55 deg F (12.7 deg C).

D. Subfloor Alkalinity Conditions: A pH range of 5 to 9 when subfloor is wetted with potable water and pHydion paper is applied.

E. Floor Preparation: Thoroughly vacuum floor to receive carpet tile prior to carpet tile installation.

F. Ventilation Requirements for Carpet Installation: Provide adequate ventilation, with continuous circulation of outside air, during installation of carpet tile. Maintain ventilation of space for at least 48 to 72 hours after completion of installation.

1.9 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Carpet Warranty: Submit a written warranty executed by carpet tile manufacturer and Installer agreeing to repair or replace carpet tile that does not meet requirements or that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1. Wear Warranty Period: Fifteen (15) years from date of Substantial Completion.
2. Anti-Static Warranty Period: Lifetime.
PART 2 - PRODUCTS

2.1 CARPET TILE (OWNER-FURNISHED)
   A. All carpet tile required will be furnished by the Owner (UMA) and turned over to Floor-
      ing Contractor for installation.

2.2 INSTALLATION MATERIALS
   A. Installation materials shall conform to the quality, function and substance of the prod-
      ucts listed below, subject to Designer's approval.
   
   B. Installation Materials:
      1. Adhesives shall meet or exceed the VOC content limits of the State of California
         South Coast Air Quality Management District (SCAQMD) Rule #1168 – Adhesive
         and Sealant Applications'.
      2. Concrete-Slab Primer: Non-staining type as recommended by the carpet tile manufac-
         turer.
      3. Trowelable Underlayments and Patching Compounds: As recommended by the carpet
         tile manufacturer.
      4. Miscellaneous: Provide other materials required for complete carpet tile and accessory
         installation.

PART 3 - EXECUTION

3.1 PREPARATORY WORK

   A. Initial Preparation under Other Sections:
      1. Surfaces to receive carpet tile materials shall be turned over to this trade level, plumb,
         true and clean, free of projections, ridges, and waves, and free of loose dirt and dust, grease,
         oil and other deleterious materials such as resin-type curing compounds, paint, glue, and
         similar materials, ready to receive work of this Section.
      2. The surfaces of concrete floor slabs to which carpet tile is to be applied shall be
         finished to tolerance acceptable to carpet tile manufacturer. When variation in
         finished surface exceeds allowable amount specified therein, it shall be brought
         within the allowable tolerance by use of machine grinding and/or latex type un-
         derlayment, applied in strict accordance with manufacturer's instructions.
B. Inspection of Surfaces and Final Preparation under This Section:

1. Thoroughly examine all surfaces to receive work of this Section, and notify the Designer in writing of all conditions and defects which would adversely affect this work. Do not commence work in any area where such notice of adverse conditions has been sent until corrective work has been completed or waived. Starting of work in any area without issuance of such notice shall constitute acceptance of conditions in the area as suitable properly to receive the work of this Section.

2. Preparation of Surfaces: All preparatory work shall strictly conform to the printed standards and written recommendations of the carpet tile manufacturer. Fill all cracks, control joints, etc. in subsurfaces using approved Crack Filler in accordance with manufacturer's printed instructions. Do final cleaning of surfaces just prior to installation, removing all dust, dirt, and other loose particles having accumulated since initial cleaning.

C. Level subfloor within 1/4 inch in 10 feet noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.

1. Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by the carpet tile manufacturer.

D. Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.

E. Vacuum clean subfloors to be covered with carpet tile. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust.

F. Ventilation Requirements for Carpet Tile Installation: Provide adequate ventilation, with continuous circulation of outside air, during installation of carpet tile. Maintain ventilation of space for at least 48 to 72 hours after completion of installation.

G. Concrete Subfloor Preparation: Apply concrete-slab primer, according to manufacturer's directions, where recommended by the carpet tile manufacturer.

3.2 INSTALLATION

A. General: Comply with CRI 104, Section 13: "Carpet Modules (Tiles)". Installation method shall be as recommended in writing by carpet tile manufacturer using full spread adhesive method.

B. Where demountable partitions or other items are indicated for installation on top of finished carpet tile floor, install carpet tile before installation of these items.

C. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

D. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
3.3 SALVAGE, MAINTENANCE SUPPLY

A. Save all carpet tile scraps 1/2 tile and larger in size. Store in location within the building in dry, protected area, as directed by Designer.

B. Return unused carpet tile to Owner.

3.4 COMPLETION, FINAL CLEANING

A. After installation is complete, remove all excess materials, packaging, etc., clean up all dirt and debris and leave entire installation in a clean condition.

B. Do not walk on or move furniture onto the carpet surface until the installed area has been anchored at the perimeter. Lay sheets of plywood or hardboard over the carpet during the placement of furniture.

C. Clean carpet tile of all spots with spot remover as recommended by carpet tile manufacturer. Remove all loose threads with sharp scissors. Then clean with vacuum cleaner with use of pile lifter or beater-bar, and leave in perfect condition.

3.5 PROTECTION

A. General: Comply with CRI 104, Section 15: "Protection of Indoor Installation."

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensures carpet tile is without damage or deterioration at the time of Substantial Completion.

END OF SECTION
SECTION 099001
PAINTING
(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS including AGREEMENT and CONDITIONS OF THE CONTRACT and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of the Section of the Specifications.

B. Time, Manner and Requirements for Submitting Trade Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority, the University of Massachusetts Amherst (UMA), at a time and place as stipulated in the “NOTICE TO CONTRACTORS”. The following should appear on the upper left hand corner of the envelope:

   Name of Sub-Bidder:___________________________________________________
   (Insert Name of Sub-Bidder)

   UMA Contract Name: UNIVERSITY OF MASSACHUSETTS AMHERST
   SOUTHWEST TOWER ENTRY VESTIBULE AND LOWRISE LOUNGE IMPROVEMENTS

   UMA Contract No: UMA 17-05

   UMA Project No. 15-1004683

   Sub-Bid for Section: SECTION 099001 - PAINTING

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended.

3. Sub-bids filed with 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 Commonwealth 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

1. Sub-bidder’s attention is directed to Massachusetts G.L. Chapter 149 Section 44F, as amended, which provides in part as follows:
2. Each sub-bidder shall list in Paragraph E of the “Form for Sub-bid” the name and bid price of each person, firm, or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub trade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specification requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

<table>
<thead>
<tr>
<th>CLASSES OF WORK</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Not Applicable / No Sub Sub-Bids Required]</td>
<td></td>
</tr>
</tbody>
</table>

3. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

b. Electrical (E-Series) Drawings: Drawings E1.01 through E1.06

1.2 DESCRIPTION OF WORK

A. Work Included: Provide all labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Surface preparation, priming, and finish coats as specified in this Section.
2. Application of specialty coatings on concrete vestibule walls typical at high-rise dormitory vestibules.
3. Application of masonry sealer on brick masonry vestibule walls at high-rise dormitory John Quincy Adams Building #355.
4. Application of specialty coating on concrete walls at jamb locations at student lounge storefront infill.
5. Priming and finish coats on all student lounge walls and ceilings. Surface preparation of walls and ceilings shall be by the University.
6. Priming and finish coats on all recreation room walls, and ceilings. Surface preparation of walls and ceilings shall be by the University.
7. Surface preparation, priming, and finish coats on steel fabricated door bumpers and card access control device enclosures. Typical at all high-rise dormitory vestibules.
8. Priming and finish coats on all conduits and pipes to match adjacent wall or ceiling color.
9. Priming and finish coats on all previously painted radiation covers and window stools.
10. Various and miscellaneous attachments to all surfaces described above.
11. The management of lead based paint on all surfaces to be refinished.

B. Items To Be Installed Only: Finish paint shall be supplied by the University.
C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Division 2 Section Selective Demolition for removal of existing wall base.
2. Division 6 Section Finish Carpentry for removal and replacement of painted wood valance.
3. Division 9 Section Resilient Wall Base for installation of new wall base.

E. Prepare and paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate.

F. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1.3 UNIT PRICES

A. Unit Prices: None

1.4 ALTERNATES

A. Alternates: None

1.5 SUBMITTALS

A. Refer to Division 01 Section Submittals for administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

B. Product Data: Manufacturer's technical information, label analysis, and application instructions for each material proposed for use.

C. Painting Schedule: List each material to be finished and cross-reference, by name, the submitted manufacturer's specific coating system - primer, finish, etc., preparation and application. Identify each coating material by the manufacturer's catalog number and general classification.

D. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

E. Samples for Verification: Colors used shall be to match existing colors. Obtain from the University the color used and provide for each color and material to be applied. Samples, where applicable, shall have texture to simulate actual substrate.
1. Provide stepped Samples, defining each separate coat, including fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.

2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.

3. Submit Samples on the following substrates for the Architect's review of color and texture only:
   
a. Field sample on the existing door and frame
   b. Field sample on the student lounge window valance

F. Mockup: Finish one typical window valance and recessed vertical blind track under Section 062000 Finish Carpentry showing construction installation to demonstrate quality of fabrication as well as qualities of materials and execution.

G. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.6 DEFINITIONS

A. "Paint" includes coating systems materials, primers, and other applied materials whether used as prime, intermediate, or finish coats, including the 2 specified finish coats over paint manufacturer's recommended, highest quality, prime coat and paint manufacturer's recommended preparation of the surface to be painted.

B. Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.7 SUBMITTALS

A. Product Data: Manufacturer's technical information, label analysis, and application instructions for each material proposed for use.

B. Painting Schedule: List each material to be finished and cross-reference, by name, the submitted manufacturer's specific coating system - primer, finish, etc., preparation and application. Identify each coating material by the manufacturer's catalog number and general classification.
C. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

D. Samples for Verification: Colors used shall be to match existing colors. Obtain from the University the color used and provide for each color and material to be applied. Samples, where applicable, shall have texture to simulate actual substrate.

1. Provide stepped Samples, defining each separate coat, including fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.

2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.

E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.8 QUALITY ASSURANCE

A. Paint products shall be low odor, low or zero VOC coating with anti-microbial properties.

B. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

C. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

D. After initial finish systems are completed and accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature. Final approval of colors will be from job applied samples.

1.9 INSTALLER QUALIFICATION

A. Contractor: The Painting Contractor shall be a professional painter who has been in business for a minimum of five years installing paint systems similar to those specified.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the 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 containers used in storage in a clean condition, free of foreign materials and residue.

C. Remove oily rags and waste daily.

1.11 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint when relative humidity exceeds 85 percent; or to damp or wet surfaces.

1.12 WARRANTY

A. Contractor: The Contractor shall provide certification that he has provided the paint manufacturer’s recommended, best quality coating system, preparation and application for the substrate and warrant the paint will not fail for a period of two (2) years from the date of Substantial Completion.

1. Failure shall be deemed to be peeling, flaking or crazing of the finish attributable to the preparation of substrate or application of the finish system.

B. Paint Manufacturer: Paint manufacturer shall warrant that his paint system will not fail for a period of two (2) years from the date of Substantial Completion.

1. Failure shall be deemed to be peeling, flaking, crazing or noticeable or excessive fading of the finish attributable to the manufacturer’s material or recommended substrate preparation or application methods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Manufacturer offering products that may be incorporated in the work is but is not limited to Pratt and Lambert. Subject to compliance with requirements, other manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1. Benjamin Moore and Co. (Moore)
2. PPG Industries, Inc. (PPG)
3. Sherwin-Williams Co. (SW)
4. Pratt & Lambert, Inc. (P&L)

B. Specified paint manufacturer’s products are based upon most recent product literature available and do not reflect product line changes made in the manufacturers’ efforts to limit environmental factors or remove mercury from their product formulations. No paint materials used on this project shall contain mercury. If the products listed do contain mercury or have been dropped from the manufacturer’s line because they contained mercury or for other environmental factors the manufacturer’s equivalent grade or a better grade product, subject to the approval of the Designer, shall be substituted for the specified product.

C. If the paint manufacturer’s current specifications for paint systems do not agree with the specified best grade, surface preparation or primer for the specified finish coats provide the paint manufacturer’s recommended surface preparation and highest quality primer.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer’s best-quality, highest performance paint material of the various coating types specified. Paint-material containers not displaying manufacturer’s product identification will not be acceptable. If a surface material not specified is encountered provide the manufacturer’s best-quality paint material for that substrate.

1. Proprietary Names: Use of manufacturer’s proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer’s material data and certificates of performance for proposed substitutions.

C. Colors: As selected by the University.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Comply with procedures specified in PDCA P4.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator’s acceptance of surfaces and conditions within a particular area.
B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Comply with manufacturer’s written instructions and recommendations applicable to substrates indicated.

B. 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.

C. 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. Comply with manufacturer’s written instructions for each particular substrate condition and as specified.
2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
3. Remove all grease, oil, and stains with chemical remover.
4. Wash all surfaces with mineral spirits.
5. Rinse with clear water.
6. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

D. Preparation of Student Lounge, Walls, Corridors, and Wood Trim

1. Removal of miscellaneous accessories by General Contractor. Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove all staples, tacks, nails, gum, scotch tape, paint, oil, grease, and all other foreign substances. The existing filler shall be removed and replaced or treated with stain to match new finish. The General Contractor is responsible for removing all existing attached mirrors, clothes poles, and reattaching after final painting. The Owner will provide new mirrors, towel bars, and clothes poles where existing are missing. The Painting Contractor shall remove any nails, screws, or hooks and dispose of properly. Any missing towel racks shall be supplied by Owner. All surfaces shall be cleaned with a non-flammable all-purpose grease cutter and cleaner.
2. Schedule cleaning and finishing so dust and other contaminants from the cleaning process will not fall on wet, newly finished surfaces.

3. Surface Preparation: Clean and prepare surfaces to be refinished according to manufacturer’s written instruction for each particular substrate condition and as specified.

4. Wood Trim: Clean surfaces of dirt, oil, and other foreign substances with scrapers, cleaners, and sandpaper or steelwool, as required. Surface imperfections such as pen marks, scratches, burns, chips, etc. shall be removed, sanded smoothly and filled with matching filler to match existing wardrobes. The entire unit is to be lightly sanded (with the grain) and cleaned before applying finishes.

E. Materials Preparations: Mix and prepare paint materials according to manufacturer’s written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

A. Apply paint in accordance with manufacturer’s directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Paint colors, surface treatments, and finishes are indicated in the paint schedules.

1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

2. Provide primer coats that are compatible with finish paint to be provided.

3. The term “exposed surfaces” includes areas visible when permanent or built-in fixtures, grilles and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

4. Paint surfaces behind movable the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

5. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.

6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

C. 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 touch-up 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 re-coat 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.

D. 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.

E. 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.

F. Prime Coats: Before applying finish coats, apply a prime coats, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Refer to Interior Paint Schedule for number of coats required.

1. Apply a second prime coat to new and repaired surfaces after first prime coat is complete.

2. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in second coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

I. Apply additional coats when undercoats or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance.
J. Sand lightly between each succeeding coat except at walls and ceilings.

K. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted.

L. Completed Work: Remove, refinish, or repaint work not in compliance with specified requirements.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied.

1. The Owner may engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner.

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 against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Designer.

B. Provide “Wet Paint” signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

C. At completion of construction activities of other trades, touch up and restore painted surfaces damaged or defaced by construction activity.

3.7 INTERIOR PAINT SCHEDULE

A. Number of coats scheduled is minimum.

B. Painting of Interior Surfaces: Important Note: Notwithstanding anything in the following scheduled to the contrary, interior painting and finishing shall conform to the applicable laws and building code regarding fire hazard classifications of finish materials.
1. Interior Walls and Ceilings:

   One Coat  Interior Latex Primer Sealer
   Two Coats  S-W Pearly White 7009

2. Interior Doors and Frames

   One Coat  Interior Latex Primer Sealer
   Two Coats  S-W Pearly White 7009

C. Existing door frame acrylic-latex, interior enamel, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.

   1. PPG: 6-6 Speed hide Interior Quick-Drying Enamel Undercoat.
   2. Finish Coat Semi-Gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.
      a. Finish coat material furnished by the University S-W Pearly White 7009

D. Wood wardrobes: Provide the following finish system: For purposes of specifying quality, the following products are manufactured by Benjamin Moore:

   1. Fill all existing nail holes, screw holes, or damaged surfaces up to 3/8" wide by 3/4" deep. Existing dents and nicks at edge conditions are not expected to be filled, only sanded out. Use a compatible wood filler such as DAP Plastic Wood Solvent Wood Filler (RTU) or approved equal for filling holes. Color to match natural wood finish.
   2. Provide touch up stain at all new and existing filled holes equal to Benwood Finishes Interior Wood Finishes Penetrating Stain 234. Color to match existing finish. Provide stain finish on all new edge banding. Provide stain finish as touch up as necessary to patched areas. Provide stain finish inclusive in unit pricing for any veneer plywood end panels. Provide stain finish to all new veneer plywood shelving and edge banding. All stain finish at new work to approximate color of finish at refinished areas of wardrobe.
   3. Provide 1 coat Benwood Finishes Polyurethane Finish High Gloss 428 (sand between coats 220 grid sandpaper).
   4. Provide 2 coats Benwood Finishes Polyurethane Finish Low Luster C435 (Sand between coats 220 grit sandpaper.)

END OF SECTION 099001
SECTION 124813

ENTRANCE FLOOR MATS

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 SUMMARY

A. Section includes: Entrance floor mats at entrance vestibules as indicated.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 093000, TILING for tile (slate) flooring adjacent to entrance mat system and including stainless steel edge at perimeter of entrance floor mats.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.

1.5 SUBMITTALS

A. General: Submit listed submittals in accordance with CONDITIONS OF THE CONTRACT and Division 01 Submittal Procedures.

B. Product Data: For specified products, submit latest edition of product supplier’s technical specifications data.

C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components.
D. Samples: Submit selection and verification samples showing the required finishes, colors, designs, and textures for flooring, as well as samples of adhesives and applicable accessories such as nosing, frames, etc.

1.6 REFERENCE STANDARDS

A. ASTM International

2. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

B. Other referenced documents

1. NFPA: National Fire Protection Association
2. Consumer Products Safety Commission (CPSC) FF 1-70: Pill Test
3. Department of Commerce (DOC) FF 1-70: Pill Test
4. AAATCC: American Association of Textile Chemists and Colorists

1.7 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Install entrance matting after finishing operations, including painting and ceiling operations, have been completed.

B. Preinstallation Meetings: Meet to confirm project requirements, substrate conditions, manufacturer’s installation instructions and warranty requirements in compliance with Division 01 requirements.

1.8 INFORMATION SUBMITTALS

A. Test and Evaluation Reports

1. Product test reports: As required by CONDITIONS OF THE CONTRACT and Division 01 Regulatory Requirements Section, submit test certificates from an independent test laboratory showing compliance with specified performance characteristics and physical properties.
2. Compatibility and adhesion test reports: Submit test reports confirming adhesive’s effectiveness with the product(s) specified.

B. Manufacturer Instructions: For specified products, submit latest editions of product supplier’s installation and cleaning and maintenance instructions.

1.9 CLOSEOUT SUBMITTALS

A. Warranty documentation: For specified products and accessories, submit product supplier’s warranty documents.
1.10 QUALITY ASSURANCE

A. Installer: Installer shall be highly experienced in performing work of this section, having previous done fiber roll goods installation work similar to that required for this project.

B. Testing Agency: Agency(ies) shall be independent and qualified to perform the specified product tests.

1.11 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 01 Product Requirements Section.

B. Delivery and Acceptance Requirements: Comply with the product supplier’s ordering and lead time requirements to avoid construction delays, and to allow material to acclimatize as required in the specified product’s installation instructions. Accept delivery of materials only if they are in unopened, undamaged packaging that bears the name and brand of the manufacturer/product supplier, project identification, and shipping and handling instructions.

C. Storage and Handling Requirements: Store material including any adhesive and accessories in the original packaging (as delivered) in areas that are enclosed and weather tight with the permanent HVAC system set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation. In addition, comply with storage and handling requirements listed on product packaging, and described in the latest edition of the product’s installation instructions.

1.12 AMBIENT SITE CONDITIONS

A. The permanent HVAC system shall be operational and set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation, during the time of installation, and for 48 hours after installation has been completed. Thereafter, minimum temperature shall be 55°F.

PART 2 – PRODUCTS

2.1 MANUFACTURER / PRODUCT

A. Supplier: Mats Inc., 37 Shuman Avenue, Stoughton, MA 02072; telephone: 1.800.MATS.INC (1.800.628.7462); fax: 1.781.344.1537; email: info@matsinc.com; website: www.matsinc.com.


C. Construction: Unbacked nonwoven continuous vinyl filaments.

D. Width: As indicated.

E. Length: As indicated.

F. Thickness: 7/16 in.
G. Weight: 244.8 ounces/square yard.

H. Colors: As selected by Owner or Designer.

I. Performance: Physical properties of the entrance matting shall conform to the following minimums:
   2. Flammability (NFPA 253): 0.82 watts/cm².
   4. Electrostatic propensity (AATCC 134): 1.2 kV.

J. Accessory Products

   1. Matting Tape: As recommended for the installation [3M Matting Seaming Tape] [3M Stay-in-Place Matting Tape 130] [3M Stay-in-Place Matting Tape 140].
   2. Adhesive: As recommended for the installation [3M Matting Adhesive].

PART 3 – EXECUTION

3.1 EXAMINATION

   A. Verification of Conditions: Subfloors shall be clean and dry. Inspect all substrates and subfloors for proper tolerances, and report any discrepancies to the general contractor in writing.

   B. Preinstallation Measurements: Verify actual measurement by field measuring before any onsite cutting, if applicable. To avoid construction delays, coordinate field measurements based upon construction progress.

3.2 SURFACE PREPARATION

   A. Concrete subfloors: Where concrete subfloors are present, all work required to put the concrete subfloor in acceptable condition shall be the responsibility of the General Contractor.

3.3 INSTALLATION

   A. Follow Division 01 relevant guidelines, and the latest edition of the manufacturer’s installation instructions.

   B. Sizes: Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer’s maximum size recommendation for units intended for removal and cleaning. Where possible, verify sizes by field measurement before shop fabrication.

   C. Accessory Selection: Where indicated for recessed applications install mat within stainless steel perimeter frame provided under work of Section 093000, TILING.
3.4 CLEANING

A. General: Clean up job site, including sweeping or dust mopping the floor to remove all dirt or grit. Follow overall cleaning guidelines described in Division 01.

B. Initial Maintenance: Conduct a full initial maintenance following the latest edition of the manufacturer’s maintenance instructions. Instruct Owner’s personnel in proper maintenance procedures.

END OF SECTION
SECTION 125120

VERTICAL LOUVER BLINDS

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 SUMMARY

A. Provide vertical louver blinds as indicated on the Drawings and as specified herein. Vertical louver blinds shall be installed at the following locations:

1. At all storefronts.

B. Items To Be Installed Only: None.

C. Items To Be Furnished Only: None.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 062000, FINISH CARPENTRY for interior trim at blind pocket.

1.3 UNIT PRICES

A. Unit Prices: None.

1.4 ALTERNATES

A. Alternates: None.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, details of installation, operational clearances, and relationship to adjoining Work.

1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
C. Samples: For each exposed finish and for each color and texture required.

D. Maintenance data.

1.6 QUALITY ASSURANCE

A. Vertical Louver Blinds Fire-Test-Response Characteristics: Provide products passing flame-resistance testing according to NFPA 701 by a testing agency acceptable to authorities having jurisdiction.

B. Corded Window Covering Product Standard: Provide vertical louver blinds complying with WCMA A 100.1.

C. Mockups: Install mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Install mockups as shown on Drawings.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 VERTICAL LOUVER BLINDS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide vertical louver blinds manufactured by one of the following, or approved equal:

2. Levolor Contract, a Newell Company, LouverDrape.

B. Finish:

1. Louver Vanes: Colors, textures, patterns, and glosses selected from manufacturer's full range.
2. Rail: Manufacturer’s standard baked-on, color-coated finish in colors as selected from manufacturer's full range.
4. Component Color: Provide cords and exposed-to-view metal and plastic matching or coordinating with vane color, unless otherwise indicated.

C. Rail System: Dual system with headrail and bottom rail.

1. Rails: Extruded aluminum long edges returned or rolled; channel-shaped, enclosing operating mechanisms.
2. Wheeled Carriers: Engineered plastic with self-lubricating wheels.

D. Louver Vanes: Lead-free, UV-stabilized, integrally colored, opaque, permanently flexible, extruded PVC that will not crack or yellow; and not less than 3/8-inch (9.5-mm) overlap when vanes are rotated fully closed.
1. Profile: Flat.
2. Nominal Vane Width: 3 inches.


G. Draw and Stack Position: One way, controls and stack left.

H. Valance: One vane insert with dust cover.

I. Mounting: Wall and permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.

1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.

J. Stack Release: Permitting stacked vanes to be moved away from stacking position for total access to glazed opening.

2.2 FABRICATION

A. Product Description: Equally spaced, synchronized louver vanes and rail system with self-aligning carrier mechanisms, carriers, traverse and vane directional mechanisms and controls, and installation hardware.

B. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.

1. Louver Directional and Traversing Control Mechanisms: With permanently lubricated moving parts.

C. Unit Sizes: Fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Blind Units Installed between (Inside) Jambs:
   a. Width: Equal to 1/4 inch (6 mm) per side or 1/2 inch (12 mm) total less than jamb-to-jamb dimension of opening in which each blind is installed.
   b. Length: Equal to 1/4 inch (6 mm), plus or minus 1/8 inch (3 mm), less than head-to-sill dimension of opening in which each blind is installed.

D. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.

E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal non-corrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Install blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware, if any.

B. Jamb Mounted: Install headrail flush with face of opening jamb and head.

C. Adjusting: Adjust vertical louver blinds to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

D. Cleaning: Clean vertical louver blind surfaces after installation, according to manufacturer's written instructions.

END OF SECTION
SECTION 230001
HEATING, VENTILATING AND AIR CONDITIONING

TABLE OF CONTENTS

(PART 1 - GENERAL)

1.0 GENERAL PROVISIONS ................................................................. 1
1.1 SCOPE OF WORK ............................................................... 2
1.2 RELATED WORK ............................................................... 3
1.3 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION ............................................ 4
1.4 DEFINITIONS ........................................................................... 5
1.5 CODES, REFERENCES AND PERMITS ........................................ 6
1.6 GENERAL REQUIREMENTS .................................................. 7
1.7 MATERIAL AND EQUIPMENT STANDARDS .............................. 8
1.8 SUBMITTALS ........................................................................ 8
1.9 OPERATION AND MAINTENANCE DATA ................................... 14
1.10 RECORD DRAWINGS ......................................................... 16
1.11 WARRANTIES ...................................................................... 17
1.12 COORDINATION .................................................................. 18
1.13 COORDINATION DRAWINGS ............................................ 19
1.14 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS .................................................. 20
1.15 INSPECTION OF SITE CONDITIONS ...................................... 21
1.16 SURVEY AND MEASUREMENTS ......................................... 21
1.17 DELIVERY, STORAGE AND HANDLING ............................... 21
1.18 PROTECTION OF WORK AND PROPERTY ............................ 22
1.19 SUPERVISION .................................................................... 22
1.20 SAFETY PRECAUTIONS ...................................................... 22
1.21 SCHEDULE .......................................................................... 22
1.22 HOISTING, SCAFFOLDING AND PLANKING ............................ 22
1.23 CUTTING AND PATCHING .................................................... 23
1.24 SLEEVES, INSERTS AND ANCHOR BOLTS .............................. 23
1.25 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS .................................................. 24
1.26 HAZARDOUS MATERIALS .................................................. 24
1.27 ACCESSIBILITY ..................................................................... 25
1.28 SEISMIC RESTRAINT REQUIREMENTS .............................................................................................. 25
1.29 WELDING QUALIFICATIONS ........................................................................................................... 25
1.30 ELECTRICAL WORK ......................................................................................................................... 26
1.31 COMMISSIONING ........................................................................................................................... 26
1.32 PROJECT CLOSEOUT ...................................................................................................................... 26

PART 2 - PRODUCTS ................................................................................................................................ 29

2.0 PIPING AND FITTINGS ...................................................................................................................... 29
2.1 PIPE HANGERS AND SUPPORTS ..................................................................................................... 36
2.2 SLEEVES ............................................................................................................................................. 39
2.3 FIRESTOPPING .................................................................................................................................. 40
2.4 PIPE EXPANSION JOINTS, GUIDES AND ANCHORS ..................................................................... 40
2.5 VALVES AND STRAINERS.................................................................................................................. 41
2.6 PIPING, EQUIPMENT, PANEL AND VALVE IDENTIFICATION ........................................................ 57
2.7 PRESSURE GAUGES, THERMOMETERS AND ACCESSORIES ....................................................... 58
2.8 MOTORS, DRIVES AND STARTERS ................................................................................................. 59
2.9 BASEBOARD RADIATION ................................................................................................................ 61
2.10 VIBRATION ISOLATION AND SEISMIC RESTRAINTS....................................................................... 62
2.11 DUCTWORK ..................................................................................................................................... 64
2.12 FLOOR GRILLES .............................................................................................................................. 70
2.13 AIR FILTERS .................................................................................................................................... 71
2.14 FAN COIL UNITS ............................................................................................................................ 71
2.15 FACTORY PAINTING ....................................................................................................................... 73
2.16 INSULATION .................................................................................................................................... 73
2.17 AUTOMATIC TEMPERATURE CONTROLS ...................................................................................... 77

PART 3 - EXECUTION ............................................................................................................................. 123

3.0 DEMOLITION .................................................................................................................................... 123
3.1 GENERAL .......................................................................................................................................... 125
3.2 IDENTIFICATION ............................................................................................................................... 126
3.3 PIPING ............................................................................................................................................. 128
3.4 FIRESTOPPING INSTALLATION ...................................................................................................... 133
3.5 CONNECTIONS TO EQUIPMENT .................................................................................................... 133
3.6 BRANCH CONNECTIONS ................................................................................................................ 134
3.7 SUPPORTS ...................................................................................................................................... 134
3.8 STRAINERS ..................................................................................................................................... 136
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.9</td>
<td>GAUGES AND THERMOMETERS</td>
<td>136</td>
</tr>
<tr>
<td>3.10</td>
<td>ANCHORS AND GUIDES</td>
<td>137</td>
</tr>
<tr>
<td>3.11</td>
<td>PIPE EXPANSION</td>
<td>137</td>
</tr>
<tr>
<td>3.12</td>
<td>VALVES AND EQUIPMENT ACCESSORIES</td>
<td>138</td>
</tr>
<tr>
<td>3.13</td>
<td>FIELD PAINTING AND COATING</td>
<td>138</td>
</tr>
<tr>
<td>3.14</td>
<td>HYDROSTATIC TESTS</td>
<td>139</td>
</tr>
<tr>
<td>3.15</td>
<td>PIPING SYSTEM, CLEANING AND FLUSHING</td>
<td>139</td>
</tr>
<tr>
<td>3.16</td>
<td>DUCTWORK</td>
<td>140</td>
</tr>
<tr>
<td>3.17</td>
<td>DUCTWORK LEAKAGE TEST</td>
<td>140</td>
</tr>
<tr>
<td>3.18</td>
<td>AIR AND HYDRONIC SYSTEMS BALANCING</td>
<td>140</td>
</tr>
<tr>
<td>3.19</td>
<td>BASES AND SUPPORTS</td>
<td>146</td>
</tr>
<tr>
<td>3.20</td>
<td>WATERPROOFING</td>
<td>147</td>
</tr>
<tr>
<td>3.21</td>
<td>MISCELLANEOUS IRON AND STEEL</td>
<td>147</td>
</tr>
<tr>
<td>3.22</td>
<td>PLACING IN SERVICE</td>
<td>147</td>
</tr>
<tr>
<td>3.23</td>
<td>CLEANING AND ADJUSTING</td>
<td>148</td>
</tr>
<tr>
<td>3.24</td>
<td>OPERATING AND MAINTENANCE INSTRUCTIONS</td>
<td>148</td>
</tr>
<tr>
<td>3.25</td>
<td>COMMISSIONING</td>
<td>149</td>
</tr>
<tr>
<td>3.26</td>
<td>TRAINING</td>
<td>149</td>
</tr>
</tbody>
</table>
SECTION 230001

HEATING, VENTILATING AND AIR CONDITIONING

(FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.0 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 the work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the “Notice to Contractors”.

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER:___________________________________________

MASS. STATE PROJECT: __________________________________________

SUB-BID FOR SECTION: 230001 HEATING, VENTILATING AND AIR CONDITIONING

2. Each sub-bid submitted for work under this section shall be on furnished forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Awarding Authority.

3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or a TREASURER’S CHECK or CASHIER’S CHECK issued by a responsible bank or trust company payable to the Awarding Authority in the amount of five percent of the sub-bid. A sub-bid accompanied by any another form of bid deposit than those specified will be rejected.

4. Sub-bidders must be DCAMM Certified in the listed trade and shall include a current DCAMM Sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder’s Update Statement with the bid.

C. Sub-Sub Bid Requirements:
1. This Sub-bidder shall list in paragraph E, on the Form for Filed Sub-Bid the name and bid price of the person, firm, or corporation who will perform the following classes of work:

<table>
<thead>
<tr>
<th>Classes of Work</th>
<th>Reference Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Insulation</td>
<td>230001</td>
</tr>
<tr>
<td>2) Sheet Metal Work</td>
<td>230001</td>
</tr>
<tr>
<td>3) Automatic Temperature Controls</td>
<td>230001</td>
</tr>
<tr>
<td>4) Balancing (independent company)</td>
<td>230001</td>
</tr>
</tbody>
</table>

D. Reference Drawings: The work of this Filed Sub-Bid is shown on the following Contract Drawings: M0.00, M0.01, MD1.01, MD1.02, M1.01, M1.02, M7.00, M7.01, and M8.00.

1.1 SCOPE OF WORK

A. This project includes the partial renovation of vestibules and student balcony areas located in the following dormitories: Kennedy House, Coolidge House, John Adams House, John Quincy Adams House, Washington House, Cance House, Pierpont House, and Moore House. Selective demolition of existing systems shall be required. This work includes the installation of new fan coil units, ductwork, piping, fittings, pipe components, insulation, grilles, fin-tube radiation, and controls. The existing HVAC system shall remain active during construction. The entire existing system shall be balanced.

B. Refer to the commissioning section of the specifications. Include all associated testing and certifications necessary for compliance and any required remedial actions and retesting due to failure.

C. The building is to be commissioned and Contractor shall provide all labor required to fully test and demonstrate that all systems operate as designed.

D. The work under this Section shall include the furnishing of all materials, labor, equipment and supplies and the performance of all operations to provide complete working systems, in general, to include the following items:

1. Piping and Fittings (all systems and types) including submitting sizing where called for on the drawings or in these specifications

2. Pipe Hangers and Supports

3. Identification

4. Sleeves, Firestopping

5. Pipe Expansion Joints, Guides and Anchors
6. Valves and Accessories (all types)
7. Pressure Gauges, Thermometers, Accessories
8. Electric Motors and Starters
9. Baseboard Radiation
10. Equipment Nameplates
11. Factory Tests
12. Vibration Isolation
13. Ductwork
14. Diffusers, Registers and Grilles
15. Air Filters
16. Fan Coil Units
17. Insulation
18. Relocation of existing HVAC components that interfere with new construction and removal and disposal of obsolete components.
19. Operating and maintenance instructions and manuals
20. Coordination drawings
21. Shop drawings
22. Cleaning, Testing, Adjusting, & Balancing of all Ducted and Piped Systems and Equipment
23. Record (as-built) Drawings
24. HVAC Control Systems
25. Seismic Restraints

E. The work to be done under this section is generally shown on the Mechanical HVAC Drawings.

1.2 RELATED WORK

A. Principal classes of Work related to the Work of this Section are listed below, and are specified to be performed under the indicated Sections of these Specifications. Refer to the indicated Sections for description of the extent and nature of the indicated Work, and for coordination with related trades. This listing may not include all related Work items. It is the responsibility of the Contractor to coordinate the Work of this Section with that of all other trades.

B. The following work is not included in this section and will be provided under other sections, except as specified herein:
1. Electrical power wiring for all HVAC equipment and to junction box(es) in mechanical areas. Power wiring from these box(es) to all control equipment (control panels, etc.) and all controls/interlock wiring shall be provided by the controls Contractor. Control wiring shall be from standby power source (if available).

2. Starters and variable speed drives that are not integral to equipment, unless specified otherwise.

3. Structural supports necessary to distribute loading from equipment to roof or floor.

4. Temporary light, power, water, heat, gas and sanitary facilities for use during construction and testing. Refer to Division 01, General Conditions.

5. Gypsum drywall enclosures of supply, return and exhaust ductwork on all rooftop/penthouse air handlers, supply and return air shafts, as shown on drawings.

1.3 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION

A. Furnish pipe sleeves for placement into formwork by the General Contractor.

B. Furnish access panels and doors for installation by the General Contractor.

1. Furnish access panels for installation in walls, ceiling and floors at locations to permit access for adjustment, removal, replacement and servicing of all concealed equipment, valves and materials installed under this Section of the specifications.

2. Access panels will be installed under the Section of the related trades of the finished surfaces in which they are located.

3. Access panels shall be located in closets, storage rooms and/or other non-public areas if possible, positioned so that the equipment can be easily reached, and the size shall be sufficient for this purpose (min. 16" x 16"). When access panels are required in corridors, lobby or other habitable areas, they will be located as directed by the Owner's Representative.

4. Access panels shall be prime painted, keyed alike and provided with cylinder lock and two keys for each panel. Units shall be manufactured by Milcor, Inland Steel, Miami Carey or approved equal. Required fire resistance of walls and ceilings shall be maintained.

C. Furnish roof curbs for installation by the Roofing Subcontractor.

D. Furnish line voltage fan speed control switches for installation by the Electrical Subcontractor.
E. Furnish and mount line voltage aquastats for wiring by the Electrical Subcontractor.

1.4 DEFINITIONS

A. As used in this Section, the following terms shall be understood to have the following meaning:

1. “Contractor,” or “Subcontractor,” unless otherwise qualified, shall mean the installer of the work specified under this Section, and shall be responsible for coordination of this work with the work of the ATC Contractor.

2. “Furnish” shall mean purchase and deliver to the project site, complete with every necessary appurtenance and product support.

3. “Install” shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.

4. “Provide” shall mean furnish and install.

5. “Work” shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.

6. “Concealed” shall mean hidden from sight in chases, furred in spaces, shafts, embedded in construction, in a crawl space, and above hung ceilings.

7. “Exposed” shall mean not installed underground or concealed as defined above.

8. “Furnished by others” shall mean materials or equipment purchased under other sections of the general contract and installed by this section of the specifications by this trade Contractor.

9. “Owner’s Representative” shall be the party responsible to make decisions regarding all contractual obligations in reference to the Scope of Work for the Owner.

10. “Date of Substantial Completion” shall indicate the date where the work has been formally accepted as evidenced by completed final punch list or where the work has reached the stage that the Owner obtains beneficial use and commences utilization of the installed systems for business or occupancy purposes. The GENERAL REQUIREMENTS, DIVISION 01, shall supersede this definition where specifically defined.

11. “Piping” shall mean, in addition to pipe or tubing, all fittings, flanges, unions, valves, strainers, drains, hangers and other accessories relative to such piping.
12. “ATC” shall mean Automatic Temperature Controls, and shall be interchangeable with “BAS” (Building Automation System).

1.5 CODES, REFERENCES AND PERMITS

A. Materials, installation of systems and equipment provided under this section shall be done in strict accordance with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, and any other Codes and Regulations having jurisdiction including but not limited to:

1. All Applicable NFPA Standards
2. State and Local Building Mechanical, Electrical, and Energy Codes
3. American Society of Mechanical Engineers (ASME)
5. American National Standards Institute (ANSI)
6. Underwriters' Laboratories, Inc. (UL)
7. Occupational Safety and Health Administration (OSHA)
8. Any other local codes or authorities having jurisdiction.

B. Heating, pumping, process piping and refrigeration systems shall be installed by Contractors and personnel appropriately licensed in the State (Installing Contractor).

C. All pressure vessels shall conform to ASME and State codes and regulations.

D. All equipment shall meet the more efficient requirement:

1. As shown on bid documents,
2. Minimum efficiencies stated in ASHRAE 90.1-2007, or

E. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, except when more rigid requirements are specified or are required by applicable codes but not limited to:

1. Air Conditioning and Refrigeration Institute (ARI)
2. Air Diffusion Council (ADC)
3. Air Movement and Control Association (AMCA)
4. American National Standards Institute (ANSI)
5. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE)
6. American Society of Mechanical Engineers (ASME)
8. American Welding Society, Inc. (AWS)
9. Associated Air Balance Council (AABC)
10. Copper Development Association (CDA)
11. Expansion Joint Manufacturers Association, Inc. (EJMA)
12. Illuminating Engineering Society (IES)
13. Manufacturer's Standardization Society of the Valve & Fitting Industry (MSS)
14. National Electrical Contractors Association (NECA)
15. National Electric Manufacturers Association (NEMA)
16. National Environmental Balancing Bureau (NEBB)
17. North American Insulation Manufacturer's Association (NAIMA)
18. Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA)
19. The Hydronics Institute (HI)
20. Thermal Insulation Manufacturer's Association (TIMA)

F. Codes, laws and standards provide a basis for the minimum installation criteria acceptable. The drawings and specifications illustrate the scope required for this project, which may exceed minimum codes, laws and standards.

G. The date of the code or standard is that in effect at the Bid date.

H. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by the Owner's Representative, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner's Representative, and without extra cost to the Owner. If work is covered before inspection and approval, this Contractor shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.6 GENERAL REQUIREMENTS

A. Nameplates

1. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, type or style, model number, catalog
number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

B. Maintenance Information
   1. Systems and equipment which require periodic maintenance to maintain efficient operation shall be furnished with complete necessary maintenance information. Required routine maintenance actions, as specified by the manufacturer, shall be stated clearly and incorporated on a readily accessible label on the equipment. Such label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product.

C. Equipment Guards
   1. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts so located that any person may come in close proximity thereto shall be completely enclosed or guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be guarded or covered with insulation of type specified for service.

1.7 MATERIAL AND EQUIPMENT STANDARDS

A. Where equipment or materials are specified with the name of a manufacturer, such specification shall be deemed to be used for the purpose of establishing a standard for that particular item. No equipment or material shall be used unless previously approved by the Owner’s Representative.

B. Substitutions (approved equals) may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified. In order for Requests for substitution to be considered, all must be submitted for pre-approval of manufacturer within 30 days of award of contract. All requests must be accompanied by a list of minimum 5-year-old successful installations of similar scope (with Owner contact and phone number), complete specifications together with drawings or samples to properly appraise the materials, equipment or process. Allow 30 days for Owner’s Representative’s review.

C. If a substitution of materials or equipment in whole or in part is made, this Contractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.

D. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved.

1.8 SUBMITTALS
A. Conform to the requirements of Division 01, General Conditions, for schedule and form of all submittals unless specifically noted otherwise in this section. Coordinate this submittal with submittals for all other finishes. Shop drawings and design layouts shall be prepared by licensed installing Contractors and shall note the name(s), license number(s) and license expiration date(s) of the Contractor(s) installing the heating systems.

B. Definitions:

1. Shop Drawings are information prepared by the Contractor to illustrate portions of the work in more detail than indicated in the Contract Documents.

2. Acceptable Manufacturers: The mechanical design for each product is based on the single manufacturer listed in the schedule or shown on the drawings. In Part 2 of the specifications certain Alternate Manufacturers are listed as being acceptable. In addition, the MATERIAL AND EQUIPMENT STANDARDS paragraph potentially allows for substitutions as being acceptable. These are acceptable only if, as a minimum, they:
   a. Meet all performance criteria listed in the schedules and outlined in the specifications. For example, to be acceptable, an air handling unit must deliver equal CFM against equal external static pressure (with the allowed pressure drop of dirty filters) using equal or less horsepower as the air handler listed in the schedules.
   b. Fit within the available space it was designed for, including space for maintenance and component removal, with no modification to either the space or the product. Clearances to walls, ceilings, and other equipment will be at least equal to those shown on the design drawings. The fact that a manufacturer’s name appears as acceptable shall not be taken to mean the Engineer has determined that the manufacturer’s products will fit within the available space – this determination is solely the responsibility of the Contractor.
   c. Products must adhere to all architectural considerations including, but not limited to: being of the same color as the product scheduled or specified, fitting within the architectural enclosures and details.

C. Submittal Procedures, Format and Requirements

1. Review submittal packages for compliance with Contract Documents and then submit to Owner’s Representative for review. Submit enough sets of shop drawings such that, after review, two sets will be kept by the reviewer, with only the remaining sets returned with reviewer's marks and comments.

2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
a. Title.
b. Equipment number.
c. Name and location of project.
d. Names of Owner, Engineer and Seller.
e. Names of manufacturers, suppliers, vendors, etc.
f. Date of submittal.
g. Whether original submittal or resubmitted.

3. Shop drawings showing manufacturer's product data shall contain detailed dimensional drawings (minimum ¼" = 1' scale) including plans and sections (where physical clearance could be an issue). Provide larger scale details as necessary. Sheet metal drawings shall show elements of Architect's reflected ceiling plan, exposed ductwork, walls and partitions (highlighting fire walls and smoke partitions), diffusers, registers, grilles, all dampers (fire, smoke, balancing, backdraft, and control dampers), sleeves and other aspects of construction as necessary for coordination.

4. Submit accurate and complete description of materials of construction, manufacturer's published performance characteristics, sizes, weights, capacity ratings (performance data, alone, is not acceptable), electrical requirements, starting characteristics, wiring diagrams, and acoustical performance for complete assemblies. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.

5. Provide shop drawings showing details of piping connections to all equipment. If connection details are not submitted and connections are found to be installed incorrectly, this Contractor shall reinstall them within the original contract price.

a. Alternate pipe joining methods such as grooved and permanent push-to-connect systems shall be shown on drawings and product submittals, and be specifically identified with the applicable manufacturer's style or series number. Installation shall include any additional hangers required for the alternate system.

6. Provide complete data for all auxiliary services and utilities required by submitted equipment. This shall include power requirements and points of connection.

7. Provide a complete description of all controls and instrumentation required including electrical power connection drawing for all components and interconnection wiring to starters, detailed information on starters, control diagrams, termination diagrams, and all control interfaces with a central control system.
8. Provide installation and erection information including; lifting requirements, and any special rigging or installation requirements for all equipment.

9. The Owner’s Representative shall approve all materials before commitment for materials is made.

D. Specifications, Schedule, and Control Sequence Compliance Statement

1. The manufacturer shall submit a point by point statement of compliance with each specification criteria listed in each paragraph for those submittals listed in Paragraph E: Product Data that are noted with an asterisk (*).

2. The statement of compliance shall consist of a list of all paragraphs (line by line) identified in Part 2 and applicable Part 3 of the specification and that the unit controls will provide all manufacturer’s portions of the control sequences shown on the drawings for which the submitted product in the opinion of the manufacturer complies, deviates, or does not meet.

3. Where the proposed submittal complies fully, the word “comply” shall be placed opposite the paragraph number.

4. Where the proposed submittal does not comply, or accomplishes the stated function in a manner different from that described, a full description of the deviation shall be provided.

5. Verify each field of the associated schedule where associated technical data is presented and sequences are shown on the drawings. Where the submitted material does not “comply” provide the value the submitted equipment will achieve based upon the specified conditions.

6. Where a full description of a deviation is not provided, it shall be assumed that the proposed system does not comply with the paragraph in question and the product will be rejected.

7. Submissions which do not include a point by point statement of compliance as specified shall be disapproved.

E. Product Data: Submit complete manufacturer’s product description and technical information including:

1. Piping and Fittings (all services, types, and joining methods)
2. Pipe Hangers and Supports
3. Identification
4. Sleeves, Firestopping
5. Pipe Expansion Joints, Guides and Anchors
6. Valves and Accessories (all types)
7. Pressure Gauges, Thermometers, Accessories
8. Electric Motors and Starters
9. Baseboard Radiation
10. Factory Tests
11. Vibration Isolation
12. Complete ductwork, equipment layout, and piping shop drawings, construction details and construction standards
13. Diffusers, Registers and Grilles
14. Air Filters
15. Fan Coil Units
16. Insulation
17. Coordination Drawing
18. Operating and maintenance instructions and manuals
19. HVAC Control Systems (*)
20. Seismic Restraints
21. Color selection charts and samples for equipment and systems in finished areas
22. Testing, Adjusting, & Balancing Qualifications, Plan, and Reports
23. Identification, labels and tags
24. O&M manual table of contents
25. O&M manual

F. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in an individual (combined) submittal.

1. Access panel shop drawings shall be submitted to the Construction Supervisor for approval.
2. Do not submit multiple product information in a single bound manual.
3. Three-ring binders shall not be accepted.

G. Deviations
1. Concerning deviations other than substitutions, proposed deviations from Contract Documents shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the deviation to the attention of the Owner’s Representative.
2. Without letters flagging the deviation to the Owner’s Representative, it is possible that the Engineer may not notice such deviation or may not
realize its ramifications. Therefore, if such letters are not submitted to the Owner’s Representative, the Seller shall hold the Engineers, his consultants and the Owner harmless for any and all adverse consequences resulting from the deviations being implemented. This shall apply regardless of whether the Engineer has reviewed or approved shop drawings containing the deviation, and will be strictly enforced.

3. Approval of proposed deviations, if any, will be made at discretion of Engineer.

H. Schedule: Incorporate shop drawing review period into construction schedule so that Work is not delayed. This Contractor shall assume full responsibility for delays caused by not incorporating the following shop drawing review time requirements into his project schedule: Allow at least 10 working days, exclusive of transmittal time, for review each time shop drawing is submitted or resubmitted with the exception that 20 working days, exclusive of transmittal time are required for the following:

1. HVAC temperature control submittals
2. Coordination Drawings
3. TAB Plan
4. TAB draft and final balancing reports.
5. O&M manuals
6. As built drawings
7. If more than five shop drawings of a single trade are received in one calendar week.

I. Responsibility

1. Intent of Submittal review is to check for capacity, rating, and certain construction features. HVAC Contractor shall ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with approved submittals to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of Contract Documents. The Engineer’s noting of some errors while overlooking others will not excuse the HVAC Contractor from proceeding in error and will not absolve the Contractor from meeting the full design intent of the associated system(s). Contract Documents requirements are not limited, waived nor superseded in any way by review.
2. Inform Contractors, manufacturers, suppliers, etc. of scope and limited nature of review process and enforce compliance with contract documents.

J. In the event that the HVAC Subcontractor fails to provide Shop Drawings for any of the products specified herein:
   1. The HVAC Subcontractor shall furnish and install all materials and equipment herein specified in complete accordance with these Specifications.
   2. If the HVAC Subcontractor furnishes and installs material and/or equipment that is not in complete accordance with these Specifications, he shall be responsible for the removal of this material and/or equipment. He shall also be responsible for the replacement of this material and/or equipment with material and/or equipment that is in complete accordance with these Specifications, at the direction of the Owner’s Representative.
   3. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall be done at no extra cost to the Owner.
   4. Removal and replacement of materials and/or equipment that is not in complete compliance with these Specifications shall not be allowed as a basis for a claim of delay of completion of the Work.

K. Mark dimensions and values in units to match those specified.

L. Submit Material Safety Data Sheets (MSD) on each applicable product with submittal.

1.9 OPERATION AND MAINTENANCE DATA

A. Commence preparation of the Operating and Maintenance (O&M) Manuals immediately upon receipt of “Approved” or “Approved as Noted” shop drawings and submit each section within one month. The final submission shall be no later than two months prior to the projected date of Substantial Completion of the Project.

B. Each O&M document shall include the manufacturer’s web address for equipment-specific O&M information for Internet access by the Owner.

C. The manual shall consist of (3) sets of manuals and include (3) sets of CDs, which shall contain the scanned content of the entire manual. The manual shall highlight the actual equipment used and not be a master catalog of all similar products of the manufacturer. The manual shall be submitted for review prior to creation of the CDs.
D. The Manual shall contain the following:

   a. Systems description including all relevant information needed for day-to-day operations and management including:
      1) Start-up requirements and procedures.
      2) Shut-down requirements and procedures, including Water Treatment systems.
      3) Trouble-shooting checklist (i.e., common alarms with possible cause & effect, etc.).
   b. Wiring diagrams, schematics, logic diagrams and sequence of operations that accurately depict the controls system.
   c. Depiction of each interface screen where programmable logic and visual displays are provided. Descriptors shall be provided to define displayed data, alarms, etc.
   d. A single sheet (for ease of removal) of all access codes and passwords necessary to access all levels of control and programming.

   a. Define all maintenance activities required to ensure system operation within manufacturers specified parameters. Maintenance documentation shall include:
      1) Data retrieval sheet
      2) Special instructions (i.e., lockout/tag-out, etc.)
      3) Special tools (i.e., key, allen wrench, etc.)
      4) Tasks
      5) Frequency
      6) Required materials, lubricants, etc.
   b. Provide table of all required activities plotted vs. interval with adequate fill-in-space for “activity completion date” and “comments”. Where multiple instrument readings are required, provide data sheet formatted to accommodate activity.
   c. Provide as part of each package, lubricating charts indicating equipment tag number, location, equipment service, greasing and lubricating requirements, lubricants, and intervals.
   d. Provide as part of each package, a valve and system chart that corresponds to the valve tags. Provide directions for normal positions and positions for equipment failure modes.
e. The HVAC Subcontractor shall furnish spare-parts data for each different item of equipment furnished. The data shall include a complete list of; parts and supplies, with current unit prices, lead time, and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the contract; and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 360 days at the particular installation. The foregoing shall not relieve the HVAC Subcontractor of any responsibilities under the guarantees specified herein.

f. Provide copy of all warranty information including extended warranties where specified with associated date of substantial completion (commencement of warranty) and end date of coverage. Define all components/subsystems specifically included and excluded.

E. Provide O&M manuals for each of the following as a minimum:
1. Pipe Expansion Joints
2. Valves and Accessories (all types, including charts for all balancing valves)
3. Electric Motors and Starters
4. Vibration Isolation
5. Air Filters
6. Fan Coil Units
7. HVAC Control Systems

1.10 RECORD DRAWINGS

A. Refer to DIVISION 01, General Conditions, for record drawings and procedures to be provided under this section, unless specifically noted otherwise in this section.

B. Record Drawings (red-line drawings) will be updated by this Contractor daily for review with the monthly requisition. The record drawing shall be an accurate depiction of the systems as completed, including dimensions (vertical/horizontal) of concealed components off fixed building elements.

C. The HVAC Foreman shall maintain complete and separate set of prints of Contract Drawings at job site at all times and shall record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design.
D. At completion of work the HVAC Contractor shall prepare a complete set of record drawings on AutoCAD showing all systems as actually installed. The Architectural background AutoCAD files will be made available for the Contractor’s copying, at his expense, to serve as backgrounds for the drawings. The HVAC Contractor shall transfer changes from field drawings onto AutoCAD drawings and submit copy of files and three sets of prints to Owner’s Representative for comments as to compliance with this section. CADD layering as established by the A & E design team shall be maintained with any and all changes done by the Contractor.

E. The Architect and Engineer are not granting to the Contractor any Ownership or property interest in the CADD Drawings by the delivery of the CADD Disks to the Contractor. The Contractor’s rights to use the CADD disks and the CADD Drawings are limited to use for the sole purpose of assisting in the Contractor’s performance of its contractual obligations under its contract with respect to the Project. The Architect and Engineer are granting no further rights. Any reuse or other use by the Contractor will be at the Contractor’s sole risk and without liability to the Architect and Engineer. The Contractor hereby waives and releases any losses, claims, damages, liabilities of any nature whatsoever, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor. The Contractor hereby waives and releases any losses, claims, damages, liabilities, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor.

F. Record Drawings, shall show “as-built” condition of all plans, mechanical room part plans, details, sections, piping diagrams, control diagram and sequence changes and corrections to schedules. Schedules shall show actual manufacturer model numbers and capacities of final installed equipment.

G. Record drawings shall include the specific locations of the following life safety and control points/sensors:
   1. All duct mounted and room sensors, including temperature sensors.

H. The HVAC Contractor shall submit the record set for approval a minimum of three weeks prior to seeking the permanent certificate of occupancy.

1.11 WARRANTIES

A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this Section. Such warranties shall be in addition to and not in lieu of all liabilities which the manufacturer and the HVAC Subcontractor may have by law or by provisions of the Contract Documents.
B. All materials, equipment and work furnished under this Section shall be guaranteed against all defects in materials and workmanship for a minimum period of one year commencing with the Date of Substantial Completion. Where individual equipment sections specify longer warranties, provide the longer warranty. Any failure due to defective material, equipment or workmanship which may develop, shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.

C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Drawings.

D. Upon receipt of notice from the Owner of the failure of any part of the systems during the guarantee period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.12 COORDINATION

A. Refer to DIVISION 01, General Conditions, for record drawings and procedures to be provided under this section, unless specifically noted otherwise in this section.

B. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as required.

C. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any conflicts shall be referred immediately to the Owner’s Representative for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Owner’s Representative’s satisfaction at no expense to the Owner.

D. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section may interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8” scale or larger working drawings and sections, clearly showing how the work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

E. Keep fully informed as to the shape, size and position of all openings required for all apparatus, piping, ductwork, etc., and give information in advance to build openings into the work. Furnish all sleeves, pockets, supports and incidentals, and coordinate with the Owner’s Representative for the proper setting of same.

F. All distribution systems which require pitch or slope such as condensate drains and water piping shall have the right of way over those which do not.
G. Make reasonable modifications in the work as required by structural interferences, interference with work of other trades, or for proper execution of the work without extra charge.

H. Keep fully informed as to the size, shape and location of all openings required for the work of this Section and give full information to all Subcontractors and the Owner’s Representative.

1.13 COORDINATION DRAWINGS

A. Provide a set of HVAC coordination drawings for use in verifying required code clearances (as well as clearances for operation, repair, removal, and testing) of all equipment and for use in coordinating installation of equipment with other trades. Where practical, the CADD layering as established by the A&E team for the construction documents shall be utilized in the preparation of all coordination drawings. Where CADD layering deviates from the A&E team’s layering convention, submit the proposed layering system for approval. The CADD layering used shall provide, as a minimum, the flexibility of illustrating trade specific items similar to the established A&E team layering standard.

B. The intent of the coordination drawings is to identify and resolve installation conflicts prior to fabrication and installation of any MEP trade.

C. The HVAC Contractor’s floor plans shall be the basis for floor plan coordination. The Electrical Contractor’s reflected ceiling plans shall be the basis for reflected ceiling plan coordination.

D. The CADD Drawings prepared by the Architect and Engineer contain representations of certain elements of the Project, and are not necessarily complete, nor are the CADD Drawings comparable or identical to final construction drawings. The Architect and Engineer make no representations or warranties with respect to the accuracy or completeness of the CADD Drawings. The Architect and Engineer do not recommend that the Contractor use the CADD Drawings in connection with the preparation of shop drawings. Should the Contractor choose to do so, however, the Contractor shall carefully review and compare the CADD Drawings with the corresponding final construction drawings to verify their accuracy and identify all discrepancies, differences, and inconsistencies in design, locations, dimensions, scope, and all other respects between the CADD Drawings and the corresponding final construction drawings. The Contractor, shall base the preparation and submission of shop drawings, and in general, shall base the performance of all its obligations with respect to the Project upon the information contained in the final construction drawings and not the CADD drawings. Nothing shall be construed as to relieve the Contractor of any of its obligations (such as, by way of illustration, the obligation to make field measurements or to coordinate drawings) under its contract with respect to the Project.
E. HVAC Coordination Drawings shall be prepared as outlined below.

1. Prepare HVAC Coordination Drawings showing all HVAC work to be installed as part of Section 230001. The Coordination Drawings shall be created using AutoCAD and shall have a scale of not less than 3/8" for mechanical/electrical rooms and ¼" for all other areas.

2. The HVAC Coordination Drawings shall show all equipment, pipes, sleeves, inserts, ducts, registers, diffusers and supports. Drawings shall include dimensions and elevation tags for all equipment, devices and material. Under no conditions shall any pipe or conduit pass through any ductwork system.

3. After incorporating all trades, resolve any areas of conflicts between trades under the direction of the General Contractor/Construction Manager and submit fully coordinated drawings to the Owner’s Representative.

4. Do not install any of this work prior to the preparation and Engineer’s review of the final Coordination Drawings. If HVAC work proceeds prior to the final Coordination Drawings, any changes to the HVAC work to correct the interferences and conflicts which result will be made by this Contractor at no additional cost to the Owner.

5. Coordination Drawings are for this Contractor’s and Owner’s Representative’s use during construction and shall not be construed as replacing any shop, “as-built”, or Record Drawings required elsewhere in these Contract Documents.

6. Owner’s Representative’s review of Coordination Drawings shall not relieve this Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

1.14 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. It is the intention of the Specifications and Drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the Drawings, but mentioned in the Specifications or vice versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided by the HVAC Subcontractor or his/her Sub Subcontractors, without additional expense to the Owner.

B. The Drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the site and shall have the approval of the Architect before being installed. The HVAC Subcontractor shall follow Drawings, including shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space.
conditions. Where space conditions appear inadequate, notify the Architect before proceeding with the installation. The HVAC Subcontractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. Any requests for information (RFI) for resolving an apparent conflict or unclarity, or a request for additional detail, shall include a sketch or equivalent description of Contractors proposed solution.

D. Sizes of ducts and pipes and routing are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge.

1.15 INSPECTION OF SITE CONDITIONS

A. Prior to submission of bid, visit the site and review the related construction documents to determine the conditions under which the Work has to be performed. Send a report, in writing, to the Owner’s Representative, noting any conditions which might adversely affect the Work of this Section of the Specifications.

1.16 SURVEY AND MEASUREMENTS

A. Base all required measurements, horizontal and vertical, from referenced points established with the Owner’s Representative and be responsible for correctly laying out the Work required under this Section of the Specification.

B. In the event of discrepancy between actual measurements and those indicated, notify the Owner’s Representative in writing and do not proceed with the related work until instructions have been issued.

1.17 DELIVERY, STORAGE AND HANDLING

A. No materials shall be delivered or stored on site until Shop Drawings have been approved.

B. All manufactured materials shall delivered to the site in original packages or containers bearing the manufacturer's labels and product identification.

C. Protect materials against dampness. Store off floors, under cover, and adequately protected from damage.

D. Inspect all equipment and materials, upon receipt at the job site, for damage and conformance to approved shop drawings.
1.18 PROTECTION OF WORK AND PROPERTY

A. This Contractor shall be responsible for the care and protection of all work included under this Section until the completion and final acceptance of this Contract.

B. Protect all equipment and materials from damage from all causes including, but not limited to, fire, vandalism and theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no additional cost to the Owner.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this Section and make good damage thus caused.

D. Damaged materials are to be removed from the site; no site storage of damaged materials will be allowed.

1.19 SUPERVISION

A. Provide a competent Supervisor with a minimum of 5 years of experience in HVAC Construction Supervision who shall be in charge of the HVAC work at the site.

1.20 SAFETY PRECAUTIONS

A. Life safety and accident prevention shall be a primary consideration. Comply with all of the safety requirements of the Owner and OSHA throughout the entire construction period of the project.

B. Furnish, place and maintain proper guards and any other necessary construction required to secure safety of life and property.

1.21 SCHEDULE

A. Construct work in sequence under provisions of Division 01 and as coordinated with the Owner’s Representative.

1.22 HOISTING, SCAFFOLDING AND PLANKING

A. The work to be done under this Section of the Specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, cranes, helicopters, scaffolds, staging and planking as required for the work.
1.23 CUTTING AND PATCHING

A. Include all coring, cutting, patching, and fireproofing necessary for the execution of the work of this Section. Structural elements shall not be cut without written approval of the Architect. This Contractor shall be responsible for taking all precautions required to identify hidden piping, conduits, etc. before any core drilling and/or cutting of slabs commences, including X-raying the affected slabs. Provide fire stopping to maintain the fire rating of the fire resistance-rated assembly. All penetrations and associated fire stopping shall be installed in accordance with the fire stopping manufacturer’s listed installation details and be listed by UL or FM.

B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.

C. Form all chases or openings for the installation of the work of this Section of the specifications, or cut the same in existing work and see that all sleeves or forms are in the work and properly set in ample time to prevent delays. Be responsible that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and consult with the Owner’s Representative and all trades concerned in reference to this work. Confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the approval of the Owner’s Representative.

D. Fit around, close up, repair, patch, and point around the work specified herein to match the existing adjacent surfaces and to the satisfaction of the Owner’s Representative.

E. Fill and patch all openings or holes left in the existing structures by the removal of existing equipment that is part of this Section of the Specifications.

F. All of this work shall be carefully done by workmen qualified to do such work and with the proper and smallest tools applicable.

G. Any cost caused by defective or ill-timed work required by this Section of the specifications shall be borne by the Subcontractor.

H. When, in order to accommodate the work required under this Section of the specifications, finished materials of other trades must be cut or fitted, furnish the necessary drawings and information to the trades whose materials must be cut or fitted.

1.24 SLEEVES, INSERTS AND ANCHOR BOLTS

A. Coordinate with other trades the location of and maintaining in proper positions, sleeves, inserts and anchor bolts to be supplied and/or set in place under this section of the specifications. In the event of incorrectly located preset sleeves,
inserts and anchor bolts, etc., all required cutting and patching of finished work shall be done under this section of the specifications.

B. All pipes passing through floors, walls, ceilings or partitions shall be provided with fire stopping to maintain the fire rating of the structure. All penetrations and associated fire stopping shall be installed in accordance with the fire stopping manufacturer’s listed installation details. Provide sleeves for all penetrations where required by the listed detail, for the penetration of all mechanical room floors and where specifically required on the drawings.

C. Field drilling (core drilling), when required, shall be performed under this section of the specifications, after receipt of approval by the Owner’s Representative.

1. When coring cannot be avoided, provide ¼ inch pilot hole prior to coring. When coring through floor or slab, verify location of core on floor below and protect and piping, ductwork, wiring, furniture, personnel, etc., below the location of the core.

1.25 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

A. Provide all supplementary steel, factory fabricated channels and supports required for proper installation, mounting and support of all equipment and systems provided under this section of the specification.

B. Supplementary steel and factory fabricated channels shall be firmly connected to building construction in a manner approved by the Owner’s Representative, as shown on the drawings, or hereinafter specified.

C. The type and size of the supporting channels and supplementary steel provided under this section of the specifications shall be determined by the Subcontractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer’s requirements for loading.

D. All supplementary steel and factory fabricated channels shall be installed in a neat and workmanlike manner parallel to the walls, floors and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

E. All supplementary steel including factory fabricated channels, supports and fittings shall be galvanized steel, aluminum, or stainless steel where exposed or subject to rust producing atmosphere and shall be manufactured by Unistrut, H-strut, Powerstrut, ERICO or approved equal.

1.26 HAZARDOUS MATERIALS

A. Dispose of all hazardous materials in accordance with Federal and State laws. All handling shall conform to EPA requirements. A uniform hazardous waste manifest
shall be prepared for all disposals and returned with all applicable signoffs prior to application for final payment. Provide breakout cost for this scope.

B. Removed equipment or fluids containing any hazardous materials such as ethylene glycol, oil, mercury or chromate shall be recycled by a licensed facility approved by the Owner’s Representative.

C. Where it has been identified that asbestos-containing material exists within the scope limits, refer to the Asbestos Abatement specification section for requirements. Where insulation is removed, provide new insulation (types and thicknesses as specified in this section). Where scope is not defined, provide unit prices with bid for all pipe and duct sizes involved.

1.27 ACCESSIBILITY

A. All work provided under this Section of the Specification shall be installed so that parts requiring periodic inspection, maintenance and repair are readily accessible. Work of this trade shall not infringe upon clearances required by equipment of other trades, especially code required clearances to electrical gear. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Owner’s Representative.

1.28 SEISMIC RESTRAINT REQUIREMENTS

A. Submit working plans and calculations reviewed, signed and stamped by a professional engineer who is registered in the State where the project is located and has specific experience in seismic calculations, certifying that the plans meet all seismic requirements established by authorities having jurisdiction over the project, including bracing for any hazardous exhaust systems.

1.29 WELDING QUALIFICATIONS

A. Piping shall be welded in accordance with qualified procedures using performance qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPV IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.9. The Owner’s Representative shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practicable. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record. Structural members shall be welded in accordance with Division 01.
B. A fire watchman with an approved fire extinguisher shall be posted at the site of the welding work, during that work, and for a minimum of 30 minutes after the work is completed, to see that sparks or drops of hot metal do not start fires.

1.30 ELECTRICAL WORK

A. All electrical apparatus and controls furnished, and the installation thereof, as a part of the HVAC work, equipment, and controls shall conform to applicable requirements under DIVISION 26 - ELECTRICAL.

1.31 COMMISSIONING

A. The HVAC systems shall be provided with system commissioning by the contractor in accordance with section C408 of the 2012 International Energy Conservation Code. The contractor shall provide commissioning and commissioning plans including preliminary commissioning reports developed by a registered design professional or an approved agency in accordance with section C408.2 of the 2012 International Energy Conservation Code. The same registered design professional or approved agency shall provide evidence of mechanical systems commissioning and completion to the professional engineer stamping the HVAC drawings in accordance with the provisions of the code sections.

1.32 PROJECT CLOSEOUT

A. Certificates Of Approval

1. Upon completion of all work, provide certificates of inspections from the following equipment manufacturers stating that the authorized factory representatives have inspected and tested the operation of their respective equipment and found the equipment to be in satisfactory operating condition and installed per the manufacturers installation instructions and requirements.
   a. Automatic Temperature Controls

B. Construction Observations By The Engineer

1. The engineer shall make progress site visits during construction and one substantial completion (punch list) site visit for determining substantial completion.

2. The Trade Contractors and the General Contractor are required to inspect their own work and make any corrections to the work to comply with the specifications and the contract documents. It is not the responsibility of the engineer to develop lists of incomplete work items.

3. Progress Site Visits
a. The purpose of the progress site visit by the engineer is to observe if the work is proceeding in accordance with the contract documents.

b. The engineer will prepare a field report which will note in general the work completed since the last observation visit, work found not to be in accordance with the contract documents and work not corrected since the previous observation visit.

C. Substantial Completion

1. When the Contractor considers the Work under this Section is substantially complete, the Contractor shall submit written notice, through the General Contractor, with a detailed list of items remaining to be completed or corrected and a schedule of when each remaining work item will be completed. Should the engineer determine the list of remaining work does not constitute substantial completion the engineer will notify the Architect and/or Owner and he will not make a substantial completion site visit.

2. The following items shall be completed prior to the written request for substantial completion site visit:
   a. Certification of successful operation of all systems.
   b. Training of the Owner’s personnel in the operation of the systems.
   c. Record Drawings in accordance with the contract specifications.
   d. Operation and Maintenance manuals.
   e. Testing reports.
   f. Balancing reports.
   g. Manufacturers certificates of approvals.
   h. Emergency contact list for reporting of malfunctioning equipment during the warrantee period.
   i. Contractors Project Completion certificate in accordance with the building code requirements.

3. Should the Engineer, during the substantial completion visit, observe that the Work is substantially complete, s/he will provide a written listing of the observed deficiencies referred herein as the Punch List. The Punch List will provide for a place for the Contractor and general Contractor to sign off and date each item individually indicating that the observed deficiency item has been corrected.

4. Should the Engineer, during the substantial completion site visit, observe that the Work is not substantially complete, s/he will provide, a written list of the major deficiencies and a reason for the work not being considered substantially complete.
5. If the work is found not to be substantially complete then the engineer shall be reimbursed for his time to re-observe the work. A re-observation fee shall be charged to the Contractor through the contractual agreement for any further observations by the engineer.

6. The Contractor shall remedy all deficiencies listed in the punch list within the time frame required by the contract.

D. Engineers Construction Completion Certification

1. Where required by the applicable code, the Engineers Construction Completion Certification will be issued by RDK Engineers when all life safety and health related issues are complete, all required functional tests are complete and all reports are complete. The following is a minimum listing of the required systems to be tested with reports generated indicating they are complete and ready for use:
   a. Air and Water Balancing
   b. Duct Pressure/Leakage Tests
   c. Pipe Pressure Tests
   d. Commissioning of Systems

2. There shall be NO outstanding items identified on the punch list for scope within any of these categories.

E. Final Completion

1. The following items shall be submitted prior to the written request for Final completion:
   a. Revised Substantial Completion items to be resubmitted in accordance with the review process comments.
   b. Warranties commencing the date of Substantial completion
   c. Individual Signed and dated Punch List acknowledging completion of all punch list items

2. When the Contractor considers all of the punch list work items complete, the Contractor shall submit written notice through the General Contractor that all Punch List items are complete and resolved and the work is ready for final observation site visit. The signature lines for completion of each punch list item shall be signed by the Contractor indicating the work is complete and signed by the General Contractor indicating s/he has inspected the work and found it to be complete. Should the Engineer find the work to be finally complete and all Punch List items are complete the Engineer will make a recommendation to the Architect or Owner. If the Engineer has found the punch list work to be incomplete during final inspection a written listing of the observed deficiencies will be prepared by the Engineer.
3. If the work is not fully complete then the engineer shall be reimbursed for his time to re-observe the work. A re-observation fee shall be charged to the Contractor through the contractual agreement for any re-observations by the engineer.

F. Re-observation Fees
1. The re-observation fee shall be $1200.00 per visit.

G. Contractor’s Project Completion Certificate
1. Upon completion of work and prior to request for Certificate of Occupancy, each Trade Contractor and the General Contractor shall issue a certificate stating that work has been installed generally consistent with construction documents and all applicable codes. RDK Engineers can furnish a blank Contractor’s certificate form upon request. The certificate shall certify:
   a. Execution of all work has been installed in accordance with the approved construction documents.
   b. Execution and control of all methods of construction was in a safe and satisfactory manner in accordance with all applicable local, state and federal statutes and regulations.
2. The certificate shall include the following information:
   a. Project.
   b. Permit Number.
   c. Location.
   d. Construction Documents.
   e. Date on Plans and Specifications submitted for approval and issuance of the Building Permit.
   f. Addendum(a) and Revision Dates.
3. The certificate shall be signed by the Contractor and include the following:
   a. Signature.
   b. Date.
   c. Company.
   d. License Number.
   e. License Expiration Date.

PART 2 - PRODUCTS

2.0 PIPING AND FITTINGS
A. General Requirements for Pipe

1. Pipe material shall be indicated in the Schedule of Pipe and Fittings for each type of service.

2. Steel pipe shall conform to ASTM A53 Grade B or ASTM A106 Grade B (A106 is required for systems with temperatures that could go over 750 degrees F) black steel. Pipe thickness (schedule) shall be as specified for the service.

3. Copper tubing shall conform to ASTM B75 or ASTM B88, seamless. Thickness (type) shall be as required for the service with a minimum safety factor of 4:1. Tubing for compressed air tubing shall conform to ASTM B251.

B. General Requirements for Fittings

1. Pipe fittings shall be indicated in the Schedule of Pipe and Fittings for each type of service. Fittings shall be rated to match the larger of the pipe pressure rating in the Schedule or the valve rating listed in the valve tables in the Part 2 Valve and Strainer section of this specification.

2. All fittings shall be installed per code requirements and the manufacturer’s best recommendations.

3. Malleable iron pipe fittings shall conform to ASME B16.3, type required to match adjacent piping.

4. Cast iron (CI) pipe fittings shall conform to ASME B16.1 or ASME B16.4 type required to match adjacent piping.

5. Steel pipe fittings shall have the manufacturer’s trademark affixed in accordance with MSS SP-25 so as to permanently identify the manufacturer. For 90° elbows, provide long radius fitting unless they will not physically fit, in which case short radius may be used. Flanges shall be flat faced weld neck up to Class 125 and raised face weld neck type for Class 150 and above.

6. The steel pipe joining methods below are only allowed when they are specifically listed in the Schedule of Pipe and Fittings:

   a. Type S1: Welded fittings shall conform to ASTM A234 with WPA marking. Butt-welded fittings shall conform to ASME B16.9, and socket welded fittings shall conform to ASME B16.11. Make fusion welded joints as required by ANSI/ASME B31.1.

   b. Type S2: Steel flanged fittings including flanges, bolts, nuts, bolt patterns, etc. shall be in accordance with ASME B16.5 for the class required (Class 150 minimum). Flange material shall conform to ASTM A53 Grade B. Blind flange material shall conform to ASTM A516 for cold service and ASTM A515 for hot service. Bolts shall be high strength or intermediate (Class 150 only) strength with material conforming to ASTM A193.
c. Type S3: Cast Iron (CI) flanged fittings shall be of malleable cast iron conforming to ASTM A47, Grade 32510. Bolts shall be high strength or intermediate (Class 125 only) strength with material conforming to ASTM A193. Class 125 iron flanges shall be limited to 175 psig / 230°F (up to 12") and 125 psig / 230°F (14" – 24"). Class 250 iron flanges shall be limited to 400 psig / 250°F (up to 12") and 250 psig / 250°F (14" – 24").

d. Type S4: Ductile iron (DI) flanged fittings shall conform to ASTM A536, Grade 65-45-12. Bolts shall be high strength or intermediate (Class 150 only) strength with material conforming to ASTM A193. Class 150 ductile iron flanges shall be limited to 225 psig / 230°F. Class 300 ductile iron flanges shall be limited to 425 psig / 450°F.

e. Type S5: Threaded joints: For use up to 2" pipe size. Pipe threads shall conform to ASME B1.20.1. Nipples shall conform to ASTM A733 or ASTM B687. Class 125 iron threaded fittings shall be limited to 150 psig / 250°F or 125 psi at 350°F. Class 250 iron threaded fittings shall be limited to 340 psig / 250°F. Class 150 ductile iron threaded fittings shall be limited to 185 psig / 250°F or 150 psig / 300°F (maximum temperature). Class 300 ductile iron threaded fittings shall be limited to 1200 psig / 250°F or 600 psig / 450°F (maximum temperature).

f. Type S6: Malleable iron pipe press fittings equal to IMS Fastlock may be used (in exposed, accessible areas only) and shall be NSF-61-4 certified, approved by the state where it will be installed, and be IAPMO approved. Sealing elements for press fittings shall be EPDM gasket and 316L stainless steel ring. System shall be suitable for, and limited to, water systems up to 2" pipe size with operating temperatures up to 210°F and maximum pressure rating up to 200 psig. Press ends shall have a design feature to assure leakage of liquids and/or gases from inside the system past the sealing element of an un-pressed connection with a 10 psig air pressure test. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

1) Do not use on steam systems or hot water systems that use steam heat exchangers. Exception: Press fitting joints may be used on hot water systems below 210° generated by low pressure steam providing the steam control valves fail closed, the hot water piping has minimum 3 foot thermal traps at the heat exchanger (both supply and return), and the first grooved joint is a minimum of 25 feet away from the heat exchanger’s thermal pipes.

g. Type S7: For use over 2" pipe size. Standard grooved mechanical pipe joints shall conform to ANSI/AWWA C606. Use is limited to low temperature water systems below 210°F and 250 psig in easily
accessible locations. Couplings shall be designed for not less than 250 psi service and shall provide a water-tight joint.

1) Do not use on steam systems or hot water systems that use steam heat exchangers. Exception: Grooved joints may be used on hot water systems below 210°F generated by low pressure steam providing the steam control valves fail closed, the hot water piping has minimum 3 foot thermal traps at the heat exchanger (both supply and return), and the first grooved joint is a minimum of 25 feet away from the heat exchanger’s thermal pipes.

2) Grooved mechanical joint fittings shall be full flow factory manufactured forged or fabricated steel fittings or cast ductile iron fittings. Mechanical pipe couplings shall consist of a housing fabricated in two parts, a synthetic rubber gasket, and nuts and bolts to secure unit together. Housings shall be of ductile iron conforming to ASTM A536, Grade 65-45-12. Coupling nuts and bolts shall be of heat treated carbon steel, zinc electroplated to ASTM B-633 and conform to ASTM A-183 and A-449, minimum 110,000 PSI tensile strength. Gaskets shall be of molded synthetic rubber, Type EPDM (for water service) with central cavity, pressure responsive configuration, rated for a temperature range of -30°F to +230°F, and shall conform to ASTM D-2000 (Gaskets shall be verified as suitable for the intended service prior to installation).

3) Rigid grooved joints shall incorporate an angle bolt pad design which maintains metal-to-metal contact of housings upon installation to insure positive rigid clamping of the pipe. Rigid grooved pipe couplings shall be used with grooved end pipes, fittings, valves and strainers. Rigid segmentally welded elbows shall not be used. Standard rigid coupling (2”-12”) housings shall be Victaulic Style 107, 07, or Grinnell Style 772, (over 12” shall be 2 piece housings equal to Victaulic AGS) and shall provide system rigidity equal to welded steel with supports and hanging requirements corresponding to ANSI B-31.1 Power Piping and ANSI B-31.9 Building Services Codes (same spacing as steel pipe).

4) Flexible grooved joints will not be permitted, except as vibration isolators adjacent to mechanical equipment other than pumps.

5) Grooves shall be prepared in accordance with the coupling manufacturer’s latest published standards. Grooving shall be performed by qualified grooving operators having demonstrated proper grooving
procedures in accordance with the tool manufacturer's recommendations. The Owner's Representative shall be notified 24 hours in advance of test to demonstrate operator's capability, and the test shall be performed at the work site, if practical, or at a site agreed upon. The operator shall demonstrate the ability to properly adjust the grooving tool, groove the pipe, and verify the groove dimensions in accordance with the coupling manufacturer's specifications.

7. Fittings for copper tubing shall be wrought copper and bronze fittings conforming to ASME B16.22 and ASTM B75 or cast copper alloy fittings conforming to ASME B16.18. Copper may be used up to 2" tubing size. Adapters may be used for connecting tubing to flanges and threaded ends of valves and equipment. The copper tubing/pipe joining methods below are only allowed when they are specifically listed in the Schedule of Pipe and Fittings:

a. Type C1: Soldered copper fittings shall use either 95/5 (Tin/Antimony), silver solder (for systems up to 250 degrees F and 175 psi), or shall be brazed (for higher temperature/pressure systems – Contractor shall submit brazing material and pressure/temperature rating of joint). Solder shall conform to ASTM B32. Solder and flux shall be lead free. Silver solder shall conform to FS QQ-B-654. Brazing alloys shall be B-Ag alloy (or equivalent strength alloy) having a melting point above 1000 degrees F.

b. Type C2: Copper and copper alloy press fittings equal to Viega ProPress may be used (in exposed, accessible areas only) and shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer and shall be suitable for, and limited to, water systems with operating temperatures up to 210°F and maximum pressure rating up to 200 psig. Press ends shall have a design feature to assure leakage of liquids and/or gases from inside the system past the sealing element of an un-pressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

c. Type C3: Grooved joints (copper tube sized) fittings (rated and limited for systems up to +210 degrees F and maximum pressure rating of 300 psi) equal to Victaulic Style 607 may be used for water systems (in exposed, accessible areas only).

8. Type SC1: Vic-Press 304™ fittings and couplings or ProPress® Stainless joints with Schedule 5 stainless steel pipe may be used for up to 2" water piping (in exposed, accessible areas only) in lieu of other copper or steel joining methods to a maximum operating temperature of +210 degrees F and
maximum pressure rating of 200 psi. Pipe shall be ASTM A312 Schedule 5, stainless steel. Fittings shall be stainless steel with EPDM O-ring seals.

a. Do not use on steam systems or hot water systems that use steam heat exchangers. Exception: Press fitting joints may be used on hot water systems below 210°F generated by low pressure steam providing the steam control valves fail closed, the hot water piping has minimum 3 foot thermal traps at the heat exchanger (both supply and return), and the first grooved joint is a minimum of 25 feet away from the heat exchanger’s thermal pipes.

9. Composition gaskets for flanges shall conform to ASME B16.21. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thickness, full face or self-centering flat ring type. Gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). NBR binder shall be used for hydrocarbon service. Gaskets shall be suitable for pressure and temperatures of piping system.

10. Unions shall conform to FS WW-U-531 or FS WW-U-516, type to match adjacent piping.

11. Adapters for copper tubing shall be brass or bronze for soldered and brazed fittings.

12. Dielectric Waterway fittings equal to PPP Clearflow shall be used where dissimilar pipe materials (such as steel and copper) in any water or glycol system are joined. Fittings shall conform to the tensile strength and dimensional requirements specified in FS WW-U-531. Waterways shall have metal connections on both ends to match adjacent piping. Metal parts of dielectric Waterways shall be fully separated by NSF/FDA listed thermoplastic lining so that the electrical current is well below 1 percent of the galvanic current that would exist upon metal-to-metal contact. Fittings shall be rated for 300 psig and 225°F. Galvanized pipe, dielectric unions, or insulated couplings shall not be used.

13. Flexible pipe connectors shall be as specified in Vibration Isolation paragraph.

C. Schedules of Pipe and Fittings

1. As used in the pipe and fitting schedule tables, closed loop systems have expansion tanks and are not open to the atmosphere, examples are chilled, hot, dual temperature and closed heat pump condenser water systems. Open loop systems are open to the atmosphere with open condenser water system being the most common.

2. Relief valve piping shall have the same pressure/temperature ratings as the fluid being relieved. Exposed outdoor piping shall be stainless steel.
### WATER AND GLYCOL SERVICES:
**UP TO 230 PSIG AT 250°F, OR 275 PSIG AT 100°F**

(Some joint types or materials may have lower pressure and/or temperature limits and Contractor shall ensure they are only used where those limits will NOT be exceeded.)

<table>
<thead>
<tr>
<th>Service</th>
<th>Pipe Material &amp; Schedule or Type</th>
<th>Joint Types Allowed</th>
<th>Fitting Material</th>
<th>Min. Pressure Class (psig) &amp; /or Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed loop piping up to 2&quot;</td>
<td>Copper / Type K</td>
<td>C1, C2, C3, or SC1</td>
<td>Copper, Bronze</td>
<td>150</td>
</tr>
<tr>
<td>Closed loop piping up to 2&quot;</td>
<td>Steel / Schedule 40</td>
<td>S5, S6, or SC1</td>
<td>CI, DI</td>
<td>250 / Standard Weight</td>
</tr>
<tr>
<td>Closed loop piping 2.5&quot;-24&quot;</td>
<td>Steel / Standard Weight</td>
<td>S1, S2, S3, S4, or S7</td>
<td>Steel, CI, DI</td>
<td>150 / Standard Weight</td>
</tr>
<tr>
<td>Open loop piping up to 2&quot;</td>
<td>Copper / Type K</td>
<td>C1, C2, C3, or SC1</td>
<td>Copper, Bronze</td>
<td>150</td>
</tr>
<tr>
<td>Open loop piping up to 2&quot;</td>
<td>Steel / Schedule 40 (80 if threaded)</td>
<td>S5, S6, or SC1</td>
<td>CI, DI</td>
<td>250 / Sched. 40 (80 if threaded)</td>
</tr>
<tr>
<td>Open loop piping 2.5&quot;-24&quot;</td>
<td>Steel / Standard Weight</td>
<td>S1, S2, S3, S4, or S7</td>
<td>Steel, CI, DI</td>
<td>150 / Standard Weight</td>
</tr>
<tr>
<td>Condensate gravity drain</td>
<td>Copper / Type M or DWV</td>
<td>C1, C2, C3, or SC1</td>
<td>Copper, Bronze</td>
<td>125</td>
</tr>
<tr>
<td>Cold water make-up</td>
<td>Copper / Type K</td>
<td>C1 (silver soldered or brazed only), C2, C3, or SC1</td>
<td>Copper, Bronze</td>
<td>150</td>
</tr>
</tbody>
</table>

### WATER AND GLYCOL SERVICES:
**UP TO 400 PSIG AT 250°F**

(Some joint types or materials may have lower pressure and/or temperature limits and Contractor shall ensure they are only be used where those limits will NOT be exceeded.)

<table>
<thead>
<tr>
<th>Service</th>
<th>Pipe Material &amp; Schedule or Type</th>
<th>Joint Types Allowed</th>
<th>Fitting Material</th>
<th>Min. Pressure Class (psig) &amp; /or Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed loop piping up to 2&quot;</td>
<td>Copper / Type K</td>
<td>C1 (brazed)</td>
<td>Copper, Bronze</td>
<td>300</td>
</tr>
<tr>
<td>Closed loop piping up to 2&quot;</td>
<td>Steel / Schedule 80</td>
<td>S5</td>
<td>CI, DI</td>
<td>250 / Schedule 80</td>
</tr>
<tr>
<td>Closed loop piping 2.5&quot;-12&quot;</td>
<td>Steel / Standard Weight</td>
<td>S1, S2, S3, or S4,</td>
<td>Steel, CI, DI</td>
<td>250 / Standard Weight</td>
</tr>
</tbody>
</table>
WATER AND GLYCOL SERVICES:
UP TO 400 PSIG AT 250°F

(Some joint types or materials may have lower pressure and/or temperature limits and Contractor shall ensure they are only be used where those limits will NOT be exceeded.)

<table>
<thead>
<tr>
<th>Service</th>
<th>Pipe Material &amp; Schedule or Type</th>
<th>Joint Types Allowed</th>
<th>Fitting Material</th>
<th>Min. Pressure Class (psig) &amp; / or Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed loop piping 14”-24”</td>
<td>Steel / Extra Strong (0.5” wall)</td>
<td>S1, S2, or S4</td>
<td>Steel, DI</td>
<td>300 / Extra Strong</td>
</tr>
<tr>
<td>Open loop piping up to 2”</td>
<td>Copper / Type K</td>
<td>C1 (brazed only)</td>
<td>Copper, Bronze</td>
<td>300</td>
</tr>
<tr>
<td>Open loop piping up to 2”</td>
<td>Steel / Schedule 80</td>
<td>S5</td>
<td>CI, DI</td>
<td>250 / Schedule 80</td>
</tr>
<tr>
<td>Open loop piping 2.5”-12”</td>
<td>Steel / Standard Weight</td>
<td>S1, S2, S3, or S4</td>
<td>Steel, CI, DI</td>
<td>250 / Standard Weight</td>
</tr>
<tr>
<td>Open loop piping 14”-24”</td>
<td>Steel / Extra Strong (0.5” wall)</td>
<td>S1, S2, or S4</td>
<td>Steel, DI</td>
<td>300 / Extra Strong</td>
</tr>
<tr>
<td>Condensate gravity drain</td>
<td>Copper / Type M or DWV</td>
<td>C1, C2, C3, or SC1</td>
<td>Copper, Bronze</td>
<td>125</td>
</tr>
<tr>
<td>Cold water make-up (to 150°F)</td>
<td>Copper / Type L</td>
<td>C1 (silver soldered or brazed only)</td>
<td>Copper, Bronze</td>
<td>250</td>
</tr>
</tbody>
</table>

2.1 PIPE HANGERS AND SUPPORTS

A. Hangers shall be as manufactured by Carpenter & Patterson, Inc., Grinnell Corporation, B-Line Systems, ERICO, or equal. Hangers shall transmit the load exclusively to the structure of the building. All hangers and supports to conform to MSS standards SP-58 and SP-69 and ANSI B 31.1.

B. Hangers for all piping 4 inches and above shall be adjustable roll type. Hangers for piping below 4 inches shall be clevis type. Hangers for piping in tunnels on strut support frames shall be roller type, similar to Fig. B379 by B-Line Systems. Additionally, the first five (5) pipe hangers on both sides of all pump piping (suction and discharge) to be precompressed spring and double-deflection neoprene style, with 30° hanging rod swing capability, similar and equal in all respects to Mason Industries Model PC 30N, selected by manufacturer for anticipated loading and deflection.

C. Provide all additional structural steel required for proper installation of hangers, anchors, guides and supports; hangers shall be arranged to maintain the required grading and pitch of piping, to prevent vibration and to provide for expansion and contraction.
D. Maximum spacing of hangers and supports for steel pipe:

<table>
<thead>
<tr>
<th>Pipe Size (inches)</th>
<th>Horizontal</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1</td>
<td>6 feet</td>
<td>10 feet</td>
</tr>
<tr>
<td>1¼-2½</td>
<td>9 feet</td>
<td>15 feet</td>
</tr>
<tr>
<td>3-and up</td>
<td>12 feet</td>
<td>15 feet</td>
</tr>
</tbody>
</table>

E. Reduce Steel pipe spacing to a maximum of 10', regardless of pipe, as necessary for fittings, valves, and other concentrated loads.

F. Horizontal copper tubing shall have maximum hanger spacing of 5' for tubing up to 1-¼” and 8’ for 1½” and larger. Vertical copper tubing shall have maximum hanger and support spacing of 10 feet. Maximum spacing for PVC pipe hangers and supports shall be 4’ (horizontal), and 10’ (vertical) with mid-story guides.

G. Steel or stainless steel tubing shall have maximum hanger and support spacing of 8 feet (horizontal) or 10 feet (vertical).

H. If any other piping material is used, the maximum hanger and support spacing shall be the lesser of manufacturers recommendation or the listed spacing in the mechanical code (currently IMC-2009 Table 305.4).

I. Branch piping and runouts of over 5 feet shall have at least one hanger or support.

J. At all copper piping, provide pipe supports with copper finish to eliminate the possibility of galvanic action.

K. Furnish additional hangers or supports at vertical or horizontal changes of direction and at locations of concentrated loads due to valves, fittings, strainers, and accessories.

L. Hangers and supports shall provide for 2” of vertical adjustments.

M. Hanger rods shall be steel, threaded and furnished with two removable nuts at each end of positioning rod and hanger and locking each in place.

N. Except as otherwise noted, hanger rods shall be of the following sizes:

<table>
<thead>
<tr>
<th>SCHEDULE OF PIPE HANGER ROD SIZES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe sizes (inches)</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>½-2</td>
</tr>
<tr>
<td>2¼-3</td>
</tr>
<tr>
<td>4 &amp; 5</td>
</tr>
</tbody>
</table>
### SCHEDULE OF PIPE HANGER ROD SIZES

<table>
<thead>
<tr>
<th>Pipe sizes (inches)</th>
<th>Single rod diameter (inches)</th>
<th>Double rod diameter (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>¾</td>
<td>5/8</td>
</tr>
<tr>
<td>8 – 12</td>
<td>N/A</td>
<td>7/8</td>
</tr>
<tr>
<td>14 – 18</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>N/A</td>
<td>1 ¼</td>
</tr>
<tr>
<td>24</td>
<td>N/A</td>
<td>1-½</td>
</tr>
</tbody>
</table>

O.Pipe covering protection saddles shall not be loaded to more than 80% of maximum loading as rated by the manufacturer.

P. Insulated piping insulation shields:
   1. Up to 3” pipe size: 18 gauge galvanized steel, located outside the vapor barrier, minimum 180° arc, 12” long, or pipe covering protection saddles.
   2. 4” pipe size and larger: pipe covering protection saddles.

Q. Vertical support shall be by means of riser clamps (anchors with split ring type allowable up to 2” size only) and adjustable pipe support with flange anchored to floor or supplementary steel.

R. Rods, clamps and hangers shall be electro-galvanized coated.

S. Valve and piping supports, from the floor, shall be equal to Carpenter & Paterson, Inc. Figure 101, adjustable pipe support and complete with pipe standard and flange, anchored to floor.
   1. Supports shall be installed at each control valve, riser, tee or elbow and where any unsupported section exceeds 4’-0” in length measured along piping centerline.

T. Upper Attachments to Building Structure:
   1. Existing Reinforced Concrete Construction: Upper attachment welded or clamped to steel clip angles that are expansion-bolted to the concrete. Expansion bolting shall be located so that piping loads place bolts in shear. Submit details for approval.
   2. Structural Steel Framing: Upper attachments welded or clamped to structural steel members. Additional steel members may be necessary in some support locations where piping locations differ from that known on contract drawings. Submit details for approval.
   3. Structural Wood Framing: Submit details for approval.
4. Expansion Fasteners and Power Set Fasteners: In existing concrete slab construction, expansion fasteners may be used for hanger loads up to one-third the manufacturer's rated strength of the expansion fastener. Power set fasteners may be used for loads up to one-fourth of rated load. When greater hanger loads are encountered, additional fasteners may be used and interconnected with steel members combining to support the hanger.

U. All hangers and shields exposed to the exterior shall be galvanized steel and PVC coated to manufacturer's standard thickness.

V. In grooved piping systems, rigid type grooved joint mechanical couplings may be used on IPS steel piping systems, which meet the support and hanging requirements of these specifications and ASME B31.1 and B31.9. Adequate numbers of flexible type couplings may also be used to compensate for thermal expansion and contraction, settling of the pipe, vibration, noise or other piping system movement. Maximum hanger spacing for flexible couplings shall be in accordance with either manufacturer's published guidelines or the requirements of Item D of this section; whichever is more stringent.

2.2 SLEEVES

A. Size sleeves to provide a minimum of 1 inch clearance around piping and ductwork, and to allow continuous runs of insulation where specified. Ensure that insulated piping and ductwork do not touch sleeves.

B. Pack clearance spaces with Thermafibre Firestopping. Caulk with fire-resistant, resilient waterproof compound, RectorSeal Biostop 500+ or equal. Ensure that fire ratings of floors and walls are maintained.

C. Piping sleeves shall be according to the following:

1. Through interior non-masonry walls, use 18 gauge rolled and tack welded galvanized steel sleeves, set flush with finished surfaces on both sides.

2. Through interior masonry walls, exterior walls above grade and roofs, use machine cut and reamed standard weight steel piping, set flush with finished surfaces on inside and to suit flashing on outside.

3. For floors in mechanical equipment rooms, and similar areas where a water dam is required, use machine cut and reamed standard weight steel piping set flush to underside of structure and extending 6 inches above finished floor.

4. For other floors, use 18 gauge rolled and tack welded galvanized steel, or machine cut and reamed plastic pipe or standard weight steel piping set flush to both finished surfaces. Refer to Room Finish Schedule.

5. Cover pipe sleeves in walls and ceilings of finished areas other than equipment rooms with satin finish stainless steel, or satin finish chrome or
nickel plated brass escutcheons, with non-ferrous set screws. Do not use stamped steel split plates. Split cast plates with screw locks may be used.

6. In non-rated walls, escutcheon plates shall be of adequate size to allow for piping with full insulation to pass through the wall uninterrupted. The interior diameter of the plate shall fit snugly around the outside diameter of the insulation.

D. Duct sleeves shall be minimum 18 gauge galvanized steel unless otherwise noted on drawings. Provide adequate bracing for support of sleeves during concrete and masonry work. For fire rated floors and walls, build fire dampers into structure to attain fire rated construction, in a manner acceptable to the local and state authorities.

E. Cover exposed duct sleeves in finished areas with 18 gauge galvanized steel plates, unless otherwise noted on drawings, in the form of duct collars. Fix in position with non-ferrous metal screws.

2.3 FIRESTOPPING

A. Provide asbestos-free firestopping material capable of maintaining an effective barrier against flame, gases, and temperature. Provide noncombustible firestopping that is nontoxic to human beings during installation or during fire conditions. Devices and equipment for firestopping service shall be UL FRD listed or FM P7825 approved for use with applicable construction, and penetrating items.

1. Fire Hazard Classification: Material shall have a flame spread of 25 or less, a smoke developed rating of 50 or less when tested in accordance with UL 723 or UL listed and accepted.

2. Firestopping Rating: Firestopping materials shall be UL FRD listed or FM P7825 approved for "F" and "T" ratings at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected, except that "F" and "T" ratings may be 3 hours for firestopping in through-penetrations of 4-hour fire rated wall or floor.

2.4 PIPE EXPANSION JOINTS, GUIDES AND ANCHORS

A. Furnish and install where shown on the drawings, a system of expansion compensation, main anchors and pipe guides to control the expansion of the new distribution piping. Unless otherwise stated, temperature fluctuation shall be between 40°F minimum and 10°F above the maximum operative temperature of the fluid. Wherever possible, expansion shall be absorbed by the use of elbows, "Z" bends, or pipe loops; otherwise expansion joints shall be used.

B. Pipe anchors shall be designed to limit movement in all planes to zero. Submit details on assembly with all locations and forces (for structural review). Assembly
to be fabricated of carbon steel and finished with one coat of rust inhibitive paint.

C. Pipe guides shall be 4-finger spider-and-sleeve type to insure multiple guiding and to allow for complete insulation of piping. Spider and sleeve shall be formed of two halves to facilitate installation of spider on pipe and mounting of guide to structure. Guides shall be provided in accordance with "Standards of the Expansion Joint Manufacturer’s Association", latest edition. Guides shall provide a minimum of axial pipe movement equal to the sum of the full movement of the expansion device plus 2”. Assembly to be fabricated of carbon steel and finished with one coat of rust inhibitive paint.

D. Expansion joints shall be in compliance with all applicable requirements of EJMA-01 and ASME B31.1.

1. Multi-ply bellows expansion joints shall be manufactured from a laminated tube consisting of multiple thin gauge 316 or 321 stainless steel plies. The tube shall then be formed into corrugations. Plies between inner and outer liner shall be spiral-wound to act as a labyrinth seal. Joint shall be designed for a minimum of 7000 full-load thermal cycles without failure. Joints shall have flanged ends rated for the full pressure rating of the bellows (minimum of 150 psi). Joints shall be tested for 150% of the rated pressure and rated for 600°F. Provide 304 stainless steel internal liner. Install joint in piping to allow for draining of water from liner. Joints shall provide the minimum axial, lateral and/or angular movements required or scheduled on the drawings. Pipe alignment guides shall be installed as recommended by joint manufacturer, but in any case shall not be more than 5 pipe diameters from expansion joint. Joints shall be as manufactured by American BOA, Metraflex, Proco Products, or approved equal.

2. Expansion Joints for Grooved Piping Systems:
   a. Packless, gasketed, slip-type expansion joint with grooved end telescoping body for installation with rigid couplings, providing up to 3” axial end movement (no angular deflection provided), suitable for water services up to 210 deg F and operating pressures up to 350 psig, or
   b. Combination of a series of grooved end short nipples joined in tandem with flexible couplings to provide increased expansion (axial and angular deflection allowed for). Joint movement and expansion capabilities determined by number of couplings/nipples used in the joint. Pressure rating determined by style and size of flexible couplings used.

2.5 VALVES AND STRAINERS

A. General:
1. Valves and strainers shall be constructed of the materials shown in the tables for each system and be rated by the manufacturer for the appropriate pressure class required for the listed pressure and temperature limits and for the fluid used and per the valve tables.

2. The manufacturers and model numbers indicated below are to be used as a means of identifying the type, quality, materials and workmanship required. Note that some of the manufacturers listed for a type of valve do not make valves for all pressure/temperature limits and/or all sizes. All valves of each type (400 psig ball, 150 psig globe, etc.) for the project shall be by the same manufacturer.

3. All valves shall be located and oriented as to valve stem direction to permit proper and easy operation, and access to valve for maintenance of packing, seat and disc. Valve stems shall not be tilted down unless approved by the manufacturer. Where valves are more than seven feet above the floor, stems shall be horizontal and all valves 2-1/2" and above shall have chain wheel and "endless link" style chain for operation from floor; where impact wheel is required, it shall be provided. Packing and gaskets shall not contain asbestos. Provide unions adjacent to equipment end of all threaded and soldered or permanent push-to-connect end valves. Provide grooved joint couplings adjacent to equipment end of all grooved end valves.

B. Service:

1. Shutoff or Isolation Valves shall be provided in all branch connections to mains and where shown on piping diagrams.
   a. In general, for 2½" and larger piping use flanged valves or grooved-ended valves in grooved water systems; butterfly valves for water and glycol systems.
   b. In general, for piping smaller than 2½" use threaded, sweat, permanent push-to-connect or press/crimped water system connections; ball valves for water, and glycol systems.

2. Balancing Valves
   a. No balancing valves are required where Pressure Independent Automatic Control Valves (PIACV) are used for a single coil. Where multiple coils are served by a single PIACV, each coil shall have a combination balancing and shut-off valve to provide proportional balancing. When non-PIACVs are used, provide automatic flow limiting valves or combination balancing and shut-off valves as shown on drawings and details for water and glycol systems and globe valves for steam and condensate. Triple duty valves (balancing with flow measurement, shut-off, and check valve) or equivalent tri-service assemblies (in grooved piping systems) can be used where shown on the drawings and allowed in the tables on pump discharges.
3. Check Valves
   a. For pump discharge use silent check valves (where allowed in the tables and where triple duty valves are not used). All others shall be swing-check type.

4. Drain Valves and Manual Vent Valves
   a. Globe with plug-type disc or ball valves (as shown on drawings).

C. Swing Check Valves: Bronze valves shall conform to MSS SP-80, of the type required for the pressure class and body connection type listed in the tables. Iron valves shall conform to MSS SP-71, of the type required for the pressure class and body connection type listed in the tables. Steel valves shall conform to ASME B16.34, of the type required for the pressure class and body connection type listed in the tables. Valves shall be as manufactured by Stockham, Milwaukee, Crane, Nibco, Victaulic (grooved), Grinnell (grooved), or Hammond.

D. Silent Check Valves: Silent check valves for use on pump discharge shall be of the materials and pressure/temperature ratings shown in the tables. Minimum open area through valve shall be at least 100% of the pipe area. Valves shall be as manufactured by Mueller, Nibco, Metraflex, APCO, Victaulic (grooved), Grinnell (grooved), or SF Equipment.

E. Globe Valves (including angle valves): Bronze valves shall conform to MSS SP-80, of the type required for the pressure class and body connection type listed in the tables. Iron valves shall conform to MSS SP-85, of the type required for the pressure class and body connection type listed in the tables. Steel valves shall conform to ASME B16.34, of the type required for the pressure class and body connection type listed in the tables. Maximum seat leakage for manual valves shall be no more than 10 cc/hr per inch of diameter. Control valves leakage shall be no more than that allowed by ANSI seat leakage Class IV (0.01% of full open valve capacity). Valves shall be as manufactured by Stockham, Milwaukee, Crane, Nibco, or Hammond. For areas where clearances are restricted, non-rising stems may be used – Contractor shall indicate locations on submittal.

F. Gate Valves: Bronze valves shall conform to MSS SP-80, of the type required for the pressure class and body connection type listed in the tables. Iron valves shall conform to MSS SP-70, of the type required for the pressure class and body connection type listed in the tables. Steel valves shall conform to ASME B16.34, of the type required for the pressure class and body connection type listed in the tables. Maximum seat leakage shall be no more than 10 cc/hr per inch of diameter. Valves shall be as manufactured by Stockham, Milwaukee, Crane, Nibco, or Hammond. For areas where clearances are restricted, non-rising stems may be used – Contractor shall indicate locations on submittal.

G. Ball Valves: Valves shall meet FS WW-V-3SC, Type II, and have the appropriate trim to meet the required pressure/temperature ratings listed in the tables. Valves shall have locking handles to allow servicing and removal of piping or
equipment. Valves on insulated piping shall have stem extension assemblies equal to the insulation thickness. Valves shall have 100% tight shut-off (no seat leakage). Valves shall be as manufactured by Conbraco Industries (Apollo), Watts, Stockham, Nibco, Hammond, or Milwaukee. Ball valves for modulating control service shall have characterized disc to provide equal percentage flow characteristics and extended rangeability. Modulating ball valves shall be Bray VCB series or Belimo B series.

H. Butterfly Valves: Provide butterfly valves of the type and materials listed in the tables. Valve necks shall allow a minimum of 2” insulation. Valves shall have the trim required to meet the listed pressures and temperatures listed in the tables. Valves shall have visual position indication. Valve seats shall have zero or near zero (bubble-tight) bi-directional seat leakage. Valves 6” and larger shall be gear operated. Valves under 6” shall be lever operated with balance stops.

1. General Service: Standard lug or grooved (in grooved systems) type with ductile or cast iron body, resilient EPDM seats, bronze, nickel, PP$ (Polyphenylene Sulfide), Nylon 11 or EPDM coated ductile iron disc and 416 stainless steel stem. Valves shall comply with MSS SP-25, MSS SP-67, and API-609. Valves shall be as manufactured by Mueller, Centerline, DeZurik, Milwaukee, Nibco, Hammond, Keystone, Bray Model 31H, Victaulic Masterseal (grooved), Grinnell Model B302 (grooved), or SF Equipment.

2. High Performance: Valves shall have lug-style carbon steel body, 316 stainless steel eccentric disc, offset 17-4 PH stainless steel shaft, and filled PTFE soft seat. Valves shall comply with ANSI B16.5, ANSI B16.34, MSS SP-25, MSS SP-61 (zero leakage), MSS SP-58, and API-609. Valves shall be as manufactured by Flowseal (Crane), Neles-Jamesbury, DeZurik, Posi-Seal, Milwaukee, Hammond or Bray/McCannalok.

I. Combination Balancing and Shutoff Valves

1. Furnish and install circuit balancing valves as shown on plans and in accordance to manufacturer's installation instructions. Valve size shall match pipe size (except ½” shall be used where flow rate is 1 GPM or less). Valves shall provide three functions: precise flow measurement, precision flow balancing, and positive drip tight shut off. Valves shall be as manufactured by Bell & Gossett, Mepco, Flowset, Tour Anderson, Taco, Nexus, Macon or Armstrong.

2. Each valve shall have two 1/4” NPT brass metering ports with Nordel or EPDM check valves and gasketed caps located on both sides of valve seat. Two additional 1/4” NPT connections with brass plugs are to be provided on the opposite side of the metering ports for use as drain connections. Drain connections and metering ports are to be interchangeable to allow for measurement flexibility when valves are installed in tight locations.

3. An integral pointer shall register degree of valve opening. Valves shall be calibrated so that flow in gpm can be determined when valve opening in
degrees or turns and pressure differential across valve is known. Valve hand-wheel shall have memory lock feature that will provide a means for locking the valve position after the system is balanced.

4. Bronze valves shall conform to MSS SP-80, of the type required for the pressure class and body connection type listed in the tables. Iron valves shall conform to MSS SP-71, of the type required for the pressure class and body connection type listed in the tables.

5. All valves on insulated piping shall be supplied with removable preformed insulation equal in R-value to the adjacent pipe insulation and a removable PVC jacket.

6. Provide one portable differential meter suitable for the operating and differential pressures specified and required, complete with hoses, vent, and carrying case.

J. Automatic Flow Limiting Valves: Valves shall be pressure flow limiting independent type with spring loading to provide the required opening to maintain constant flow across the entire control pressure range. Valve flow selection shall be adjustable on the valve assembly with a minimum range of +50% above the design flow. Valves whose flow rate can’t be field selected (fixed flow) shall be selected within the range of -5% to +10% of the design flow and be provided with replacement flow cartridges as required by the balancing Contractor or engineer. The valves shall be provided with a permanent nameplate or tag carrying a record of the factory-determined flow rate, flow range and flow control pressure ranges. Valves shall be certified to control the flow within 5 percent of the flow set per the tag’s listed flow and control pressure range. Unless shown otherwise, the minimum control pressure range shall be 2 to 32 psid. Valves shall be of materials suitable for the maximum operating pressure and temperature listed in the table for the intended service. Valves up to 2-inches shall be threaded or solder-end. Valves over 2-inches shall be flanged. Each valve shall have a pressure fitting with quick disconnect valve located on both sides of the valve. Provide deluxe meter kit in carrying case. Provide molded insulation kit. Valves shall be as manufactured by Griswold, Flow Design/Autoflow, Macon, Hays or Nexus.

K. Pressure Independent Automatic Control Valves: The intent is for PIACVs to be used for all modulating 2-way control valves on all water systems (including glycol). Each pressure independent (PI) automatic control valve (ACV) is a two-section valve referred to herein as a PIACV. These valves shall be self balancing (pressure independent) over a minimum operating range across both sections of the valve assembly of 6 to 45 psid (or up to 58 psid where the associated pump head is over 130 feet) with the mechanical PI section limiting the differential pressure over the ACV section to provide very stable and accurate control. Electronic PI sections are not allowed as they require the ACV section to absorb the entire pressure drop at the maximum psid. Control valves leakage shall be no more than that allowed by ANSI seat leakage Class IV (0.01% of full open valve capacity). See the Controls section of the specifications for further information and requirements for these valves.
L. Strainers

1. Strainer-body connections shall be the same size as the pipe lines in which the connections are installed. The bodies shall have arrows clearly cast on the sides to indicate the direction of flow. Each strainer shall be equipped with an easily removable cover and sediment basket. The body or bottom opening shall be equipped with a tapped blowdown opening. Provide full size nipple and appropriate type of valve for blowdown. The basket shall be of stainless steel with small perforations of sufficient number to provide a net free area through the basket of at least 5 times that of the entering pipe. The flow shall be into the basket and out through the perforations. Bronze strainers shall conform to MSS SP-80, of the type required for the pressure class and body connection type listed in the tables. Iron strainers shall conform to MSS SP-71, of the type required for the pressure class and body connection type listed in the tables. Steel strainers shall conform to ASME B16.34, of the type required for the pressure class and body connection type listed in the tables. Y-type strainers are listed in the tables, provide basket type strainers of same construction where shown on drawings. Strainers shall be as manufactured by Mueller, Sarco, Watts, Armstrong, Keckley, or Yarway.

2. Strainers for grooved end piping systems shall be of the same size as the pipe lines in which the connections are installed. The bodies shall have arrows clearly cast on the sides to indicate the direction of flow. Each strainer shall be equipped with an easily removable cover and sediment basket. The body or bottom opening shall be equipped with a tapped blowdown opening:
   
a. Y-pattern, 2" through 12" sizes, 300 psi maximum pressure rating. Suitable for services up to 210°F, ductile iron body, Type 304 stainless steel perforated metal removable baskets, blowdown port with pipe plug and grooved ends.

b. T-pattern, 2" through 12" sizes, 300 psi maximum pressure rating. Suitable for services up to 210°F, ductile iron body, Type 304 stainless steel frame and mesh removable basket, removable access coupling/cap for strainer maintenance, and grooved ends.

c. T-pattern, 14" through 24" sizes, 300 psi maximum pressure rating. Suitable for services up to 210°F, carbon steel body, Type 304 stainless steel frame and mesh removable basket, carbon steel T-bolt hinged closure/cap for strainer maintenance, and grooved ends.

M. Suction Diffusers

1. Where shown furnish pump inlet suction diffusers as manufactured by Mueller, Bell & Gossett, Armstrong, Taco, or Paco. Units shall consist of an angle type body with inlet vanes and a combination diffuser/strainer and straightening vanes for use on pump inlet. The body or bottom opening
shall be equipped with a tapped blowdown opening. Provide full size nipple and appropriate type of valve for blowdown. The basket shall be of stainless steel with small perforations of sufficient number to provide a net free area through the basket of at least 5 times that of the entering pipe. Unit shall be equipped with a disposable fine mesh start up strainer that shall be removed after system flushing. The body shall be full line size, non-reducing type. Provide reducer as required to fit the pump. Units shall be provided with adjustable support feet to relieve piping strains from the pump suction. Provide valved gauge connections with gauges at diffuser inlet and pump suction to indicate when cleaning is required. Iron strainers shall conform to MSS SP-71, of the type required for the pressure class and body connection type listed in the tables. Steel strainers shall conform to ASME B16.34, of the type required for the pressure class and body connection type listed in the tables.

Where shown furnish pump inlet suction diffusers as manufactured by Victaulic or Grinnell on grooved installations. Unit shall be full line size, non-reducing type with flanged outlet and grooved inlet connections, ductile iron body, angle-type, 304 stainless steel frame and perforated sheet diffuser. Removable 20 mesh stainless steel startup pre-filter, outlets for pressure/temperature drain connection and base support boss, 300 psi maximum pressure rating and 210°F maximum operating temperature.

N. Water Pressure Reducing and Back-pressure Valves
1. Valves shall be as manufactured by Bell and Gossett, Armstrong, Taco, Spence, Sarco, Leslie, Kay & MacDonald, Cashco, or Watts.

2. Provide pressure reducing and back-pressure regulating valves where shown on the drawings. Valves shall be constructed for the applicable temperature and pressure limits in the table for the service intended.

3. Make-up water PRVs shall be provided with integral low inlet-pressure check valves (optionally an external check could be substituted) and inlet strainers. The strainers shall be easily removable without system shutdown. The valve seat, strainer and stem shall be removable and of non-corrosive material. The body shall be brass. The valve shall be full line sized as shown on the Drawings. Pressure setting to be minimum system operating pressure (static head plus approximately 4 psi).

O. Pressure Relief Valves and Accessories
1. Pressure relief valves shall be provided where shown on the drawings in accordance with ASME BPV VIII Division 01. Relief valves shall be constructed for the maximum pressure the system can operate at. The aggregate relieving capacity of the relief valves shall be not less than that required by the above code. Provide at least one relief valve for each closed loop piping system. Discharge from water relief valves shall be to indirect drain. Valves shall be as manufactured by Watts, Kunkle, Lonergan, or Lunkenheimer.
2.

*P.* Air Vents: Provide air vents at all high points in the piping systems meeting the pressure and temperature limits shown on the table for each system.

1. Automatic: Normal Capacity – Float operated with bronze or steel body and stainless steel internals, ball-check valve type with materials as required for the pressure/temperature listed in the table for the system. Provide each vent with safe drainage piping for venting air/water to drain.

2. Manual: For low pressure/temperature water and glycol systems, provide 1/8-in. brass body, chrome plated with two-detachable keys. For higher pressure/temperature systems, provide globe valves with plug-type disc or ball valves with materials, as required and allowed in the table for the system.

*Q.* Drain Valves: Drain valves shall be one of the type listed for isolation in the table for each piping system. Provide drain connections at all equipment and all low points in the piping systems to allow for complete drainage. Drain connections shall have full size threaded hose end connections with cap/plug. For piping up to 4", provide minimum ¾" valves. For piping between 4" and 10", provide minimum 1½" valves. For piping larger than 10", provide minimum 2" valves. Provide 50' of premium grade hose for each size drain.

*R.* Valve Lubrication: Furnish a lubrication gun in the mechanical equipment room with extra lubricant sticks sufficient to repack each valve. Guns shall be extra heavy, lever type hydraulic hand type with automatic shutoff, 1500 psi gauge and 12" long connecting hose. Lubricant shall be as required by valve manufacturer for the service intended.
## WATER SERVICES:
### Maximum 150 psig at 250°F (Heating & Dual Temperature Systems)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim</th>
<th>Type of Connection</th>
<th>Minimum Pressure Rating/Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball</td>
<td>To 2&quot;</td>
<td>2 or 3 piece</td>
<td>Isolation or ATC Modulation (with characterized disc)</td>
<td>Brass or Bronze/RTFE</td>
<td>Sweat (3-piece only) or Threaded (2 or 3-piece)</td>
<td>400 psig CWP (Cold Working Pressure) or ANSI Class 150</td>
</tr>
<tr>
<td>PIACV</td>
<td>To 2&quot;</td>
<td>Control &amp; Balancing</td>
<td>ATC Modulation for Water &amp; Glycol Systems</td>
<td>Brass or Bronze/RTFE</td>
<td>Threaded</td>
<td>400 psig CWP or ANSI Class 150</td>
</tr>
<tr>
<td>PIACV</td>
<td>2½&quot; and up&quot;</td>
<td>Control and Balancing</td>
<td>ATC Modulation for Water &amp; Glycol Systems</td>
<td>Ductile Iron/EPDM</td>
<td>Flanged</td>
<td>ANSI Class 150 for 150 psig or Class 300 for 275 psig</td>
</tr>
<tr>
<td>Butterfly</td>
<td>2½&quot; - 12&quot;</td>
<td>General Service</td>
<td>Isolation or ATC 2-Position</td>
<td>Iron/EPDM</td>
<td>Flanged</td>
<td>200 psig CWP, Bi-directional, dead end service.</td>
</tr>
<tr>
<td>Butterfly</td>
<td>14&quot; - 48&quot;</td>
<td>General Service</td>
<td>Isolation or ATC 2-Position</td>
<td>Iron/EPDM</td>
<td>Flanged</td>
<td>150 psig CWP, Bi-directional, dead end service.</td>
</tr>
<tr>
<td>Butterfly</td>
<td>2½&quot; - 24&quot;</td>
<td>High Performance (Double offset)</td>
<td>ATC Modulation (Cv at 2/3 open)</td>
<td>Steel/Reinforced PTFE</td>
<td>Flanged</td>
<td>ANSI Class 150</td>
</tr>
<tr>
<td>Globe</td>
<td>To 2&quot;</td>
<td>Control</td>
<td>ATC Modulation</td>
<td>Bronze/Brass</td>
<td>Threaded</td>
<td>ANSI Class 125 for 150 psig or Class 200 for 275 psig</td>
</tr>
<tr>
<td>Balancing /Shutoff</td>
<td>To 2&quot;</td>
<td>Flow Indication</td>
<td>Isolation and balancing</td>
<td>Bronze or Brass/Brass</td>
<td>Threaded</td>
<td>ANSI Class 125 or 300 psig CWP</td>
</tr>
<tr>
<td>Balancing /Shutoff</td>
<td>2½&quot; - 12&quot;</td>
<td>Flow Indication</td>
<td>Isolation and balancing</td>
<td>Iron or Steel/Brass</td>
<td>Flanged</td>
<td>ANSI Class 125 for 150 psig or 300 psig CWP for 275 psig</td>
</tr>
</tbody>
</table>
## WATER SERVICES:
Maximum 150 psig at 250°F (Heating & Dual Temperature Systems)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim Body/Seat</th>
<th>Type of Connection</th>
<th>Minimum Pressure Rating/Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triple Duty</td>
<td>To 2&quot;</td>
<td>Flow Indication</td>
<td>Pump discharge isolation, check, and balancing</td>
<td>Bronze or Ductile or Cast Iron /Bronze</td>
<td>Threaded or Flanged</td>
<td>ANSI Class 125 for 150 psig or Class 200 for 275 psig</td>
</tr>
<tr>
<td>Triple Duty</td>
<td>2½&quot; - 12&quot;</td>
<td>Flow Indication</td>
<td>Pump discharge isolation, check, and balancing</td>
<td>Bronze or Ductile or Cast Iron /Bronze</td>
<td>Flanged</td>
<td>ANSI Class 125 for 150 psig or 300 CWP for 275 psig</td>
</tr>
<tr>
<td>Check</td>
<td>To 2&quot;</td>
<td>Silent</td>
<td>Pump discharge</td>
<td>Bronze or Stainless Steel /Brass, Bronze or Stainless Steel</td>
<td>Threaded or Flanged</td>
<td>300 psig CWP</td>
</tr>
<tr>
<td>Check</td>
<td>2&quot; - 24&quot;</td>
<td>Silent Globe</td>
<td>Pump discharge</td>
<td>Ductile or Cast Iron or Steel /Bronze or Stainless Steel</td>
<td>Flanged</td>
<td>ANSI Class 125 for 150 psig or Class 250 or 150 Steel for 275 psig</td>
</tr>
<tr>
<td>Check</td>
<td>To 2&quot;</td>
<td>Swing</td>
<td>Piping</td>
<td>Bronze/Bronze</td>
<td>Threaded</td>
<td>ANSI Class 125 for 150 psig or Class 200 for 275 psig</td>
</tr>
<tr>
<td>Check</td>
<td>2½&quot; - 12&quot;</td>
<td>Swing</td>
<td>Piping</td>
<td>Iron or Steel /Bronze or 13 Cr Steel</td>
<td>Flanged</td>
<td>ANSI Class 125 for 150 psig or Class 250 or 150 Steel for 275 psig</td>
</tr>
<tr>
<td>Check</td>
<td>12&quot; - 24&quot;</td>
<td>Swing</td>
<td>Piping</td>
<td>Iron or Steel /Bronze or 13 Cr Steel</td>
<td>Flanged</td>
<td>ANSI Class 125 for 150 psig or Class 250 or 150 Steel for 275 psig</td>
</tr>
<tr>
<td>Strainer</td>
<td>To 2&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Bronze/Stainless s 1/16&quot; screen</td>
<td>Threaded</td>
<td>ANSI Class 125 for 150 psig or Class 200 for 275 psig</td>
</tr>
</tbody>
</table>
## WATER SERVICES:
**Maximum 150 psig at 250°F (Heating & Dual Temperature Systems)**

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim Body/Seat</th>
<th>Type of Connection</th>
<th>Minimum Pressure Rating/Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strainer</td>
<td>2½&quot; – 4&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Iron or Steel/Stainless 1/16&quot; screen</td>
<td>Flanged</td>
<td>ANSI Class 125 for 150 psig or Class 250 or 150 Stl for 275 psig</td>
</tr>
<tr>
<td>Strainer</td>
<td>5&quot; – 12&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Iron or Steel/Stainless 1/8&quot; screen</td>
<td>Flanged</td>
<td>ANSI Class 125 for 150 psig or Class 250 or 150 Steel for 275 psig</td>
</tr>
<tr>
<td>Strainer</td>
<td>14&quot; – 24&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Iron or Steel/Stainless 1/8&quot; screen</td>
<td>Flanged</td>
<td>ANSI Class 250 or 150 Steel</td>
</tr>
<tr>
<td>Strainer</td>
<td>To 16&quot;</td>
<td>Suction Diffuser</td>
<td>Pump Inlet (non-reducing)</td>
<td>Cast or Ductile Iron/Stainless 5/32&quot; screen</td>
<td>Threaded (to 2&quot;) or Flanged</td>
<td>300 psig CWP or ANSI Class 125</td>
</tr>
</tbody>
</table>
## WATER SERVICES:
**Maximum 230 psig at 250°F (Heating & Dual Temperature Systems)**

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim Body/Seat</th>
<th>Type of Connection</th>
<th>Minimum Pressure Rating/Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball</td>
<td>To 2&quot;</td>
<td>2 or 3 piece</td>
<td>Isolation or ATC Modulation (with characterized disc)</td>
<td>Bronze or Steel/Stainless Steel/RTFE</td>
<td>Threaded (2 or 3-piece)</td>
<td>600 psig CWP (Cold Working Pressure) or ANSI Class 150</td>
</tr>
<tr>
<td>PIACV</td>
<td>To 2&quot;</td>
<td>Control &amp; Balancing</td>
<td>ATC Modulation for Water &amp; Glycol Systems</td>
<td>Bronze/RTFE</td>
<td>Threaded</td>
<td>600 psig CWP or ANSI Class 150</td>
</tr>
<tr>
<td>PIACV</td>
<td>2½&quot; and up&quot;</td>
<td>Control and Balancing</td>
<td>ATC Modulation for Water &amp; Glycol Systems</td>
<td>Ductile Iron/EPDM</td>
<td>Flanged</td>
<td>ANSI Class 300</td>
</tr>
<tr>
<td>Butterfly</td>
<td>2½&quot; - 24&quot;</td>
<td>High Performance (Double offset)</td>
<td>Isolation and ATC Modulation (Cv at 2/3 open)</td>
<td>Steel/Reinforced PTFE</td>
<td>Flanged</td>
<td>ANSI Class 150</td>
</tr>
<tr>
<td>Globe</td>
<td>To 2&quot;</td>
<td>Control</td>
<td>ATC Modulation</td>
<td>Bronze/Brass</td>
<td>Threaded</td>
<td>ANSI Class 150</td>
</tr>
<tr>
<td>Balancing/Shutoff</td>
<td>To 2&quot;</td>
<td>Flow Indication</td>
<td>Isolation and balancing</td>
<td>Bronze or Brass/Brass</td>
<td>Threaded</td>
<td>ANSI Class 150 or 300 psig CWP</td>
</tr>
<tr>
<td>Balancing/Shutoff</td>
<td>2½&quot; - 12&quot;</td>
<td>Flow Indication</td>
<td>Isolation and balancing</td>
<td>Iron or Steel/Brass</td>
<td>Flanged</td>
<td>ANSI Class 250 Iron or Class 150 Steel</td>
</tr>
<tr>
<td>Triple Duty</td>
<td>To 2&quot;</td>
<td>Flow Indication</td>
<td>Pump discharge, isolation, check, and balancing</td>
<td>Bronze or Cast or Ductile Iron/Bronze</td>
<td>Threaded or Flanged</td>
<td>ANSI Class 150 Bronze, Class 250 Cast Iron or Class 300 Ductile</td>
</tr>
<tr>
<td>Triple Duty</td>
<td>2½&quot; - 12&quot;</td>
<td>Flow Indication</td>
<td>Pump discharge, isolation, check, and balancing</td>
<td>Bronze or Cast or Ductile Iron/Bronze</td>
<td>Flanged</td>
<td>ANSI Class 200 Bronze, Class 250 Cast Iron or Class 300 Ductile</td>
</tr>
<tr>
<td>Check</td>
<td>To 2&quot;</td>
<td>Silent</td>
<td>Pump discharge</td>
<td>Bronze or Stainless Steel/Brass, Bronze or Stainless Steel</td>
<td>Threaded or Flanged</td>
<td>300 psig CWP or ANSI Class 150</td>
</tr>
</tbody>
</table>
### WATER SERVICES:
Maximum 230 psig at 250°F (Heating & Dual Temperature Systems)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim Body/Seat</th>
<th>Type of Connection</th>
<th>Minimum Pressure Rating/Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>2&quot; - 24&quot;</td>
<td>Silent Globe</td>
<td>Pump discharge</td>
<td>Cast or Ductile Iron or Steel /Bronze or Stainless Steel</td>
<td>Flanged</td>
<td>ANSI Class 250 Cast Iron, Class 300 Ductile or Class 150 Steel</td>
</tr>
<tr>
<td>Check</td>
<td>To 2&quot;</td>
<td>Swing</td>
<td>Piping</td>
<td>Bronze/Bronze</td>
<td>Threaded</td>
<td>ANSI Class 150</td>
</tr>
<tr>
<td>Check</td>
<td>2½&quot; - 12&quot;</td>
<td>Swing</td>
<td>Piping</td>
<td>Iron or Steel /Bronze or 13 Cr steel</td>
<td>Flanged</td>
<td>ANSI Class 250 Iron or Class 150 Steel</td>
</tr>
<tr>
<td>Check</td>
<td>12&quot; - 24&quot;</td>
<td>Swing</td>
<td>Piping</td>
<td>Iron or Steel /Bronze or 13 Cr Steel</td>
<td>Flanged</td>
<td>ANSI Class 250 Iron or Class 150 Steel</td>
</tr>
<tr>
<td>Strainer</td>
<td>To 2&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Bronze/Stainless 1/16&quot; screen</td>
<td>Threaded</td>
<td>ANSI Class 150</td>
</tr>
<tr>
<td>Strainer</td>
<td>2½&quot; - 4&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Iron or Steel /Stainless 1/16&quot; screen</td>
<td>Flanged</td>
<td>ANSI Class 250 Iron or Class 150 Steel</td>
</tr>
<tr>
<td>Strainer</td>
<td>5&quot; - 12&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Iron or Steel/Stainless 1/8&quot; screen</td>
<td>Flanged</td>
<td>ANSI Class 250 Iron or Class 150 Steel</td>
</tr>
<tr>
<td>Strainer</td>
<td>14&quot; - 24&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Iron or Steel/Stainless 1/8&quot; screen</td>
<td>Flanged</td>
<td>ANSI Class 250 Iron or Class 150 Steel</td>
</tr>
<tr>
<td>Strainer</td>
<td>To 16&quot;</td>
<td>Suction Diffuser</td>
<td>Pump Inlet (non-reducing)</td>
<td>Cast or Ductile Iron /Stainless 5/32&quot; screen</td>
<td>Threaded (to 2&quot;) or Flanged</td>
<td>300 psig CWP or ANSI Class 250</td>
</tr>
</tbody>
</table>
**WATER SERVICES:**
Maximum 400 psig at 250°F (Heating & Dual Temperature Systems)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim Body/Seat</th>
<th>Type of Connection</th>
<th>Minimum Pressure Rating/Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball</td>
<td>To 2&quot;</td>
<td>2 or 3 piece</td>
<td>Isolation or ATC Modulation (with characterized disc)</td>
<td>Bronze or Steel/Stainless Steel/RTFE</td>
<td>Threaded (2 or 3-piece)</td>
<td>ANSI Class 300 for 250°F, or 600 psig CWP for 120°F</td>
</tr>
<tr>
<td>PIACV</td>
<td>To 2&quot;</td>
<td>Control &amp; Balancing</td>
<td>ATC Modulation for Water &amp; Glycol Systems</td>
<td>Bronze/RTFE</td>
<td>Threaded</td>
<td>ANSI Class 300 for 250°F, or 600 psig CWP for 120°F</td>
</tr>
<tr>
<td>PIACV</td>
<td>2½&quot; and up&quot;</td>
<td>Control and Balancing</td>
<td>ATC Modulation for Water &amp; Glycol Systems</td>
<td>Ductile Iron/EPDM</td>
<td>Flanged</td>
<td>ANSI Class 300</td>
</tr>
<tr>
<td>Butterfly</td>
<td>2½&quot; - 24&quot;</td>
<td>High Performance (Triple offset)</td>
<td>Isolation and ATC Modulation (Cv at 2/3 open)</td>
<td>Steel/Reinforced PTFE</td>
<td>Flanged</td>
<td>ANSI Class 300</td>
</tr>
<tr>
<td>Globe</td>
<td>To 2&quot;</td>
<td>Control</td>
<td>ATC Modulation</td>
<td>Bronze/Brass</td>
<td>Threaded</td>
<td>ANSI Class 300</td>
</tr>
<tr>
<td>Balancing/Shutoff</td>
<td>To 2&quot;</td>
<td>Flow Indication</td>
<td>Isolation and balancing</td>
<td>Bronze or Brass/Brass</td>
<td>Threaded</td>
<td>ANSI Class 300 or 400 psig at 250°F Working Pressure</td>
</tr>
<tr>
<td>Balancing/Shutoff</td>
<td>2½&quot; -12&quot;</td>
<td>Flow Indication</td>
<td>Isolation and balancing</td>
<td>Iron or Steel/Brass</td>
<td>Flanged</td>
<td>ANSI Class 250 Cast Iron or Class 300 Steel</td>
</tr>
<tr>
<td>Triple Duty</td>
<td>To 2&quot;</td>
<td>Flow Indication</td>
<td>Pump discharge isolation, check, and balancing</td>
<td>Bronze or Cast or Ductile Iron/Bronze</td>
<td>Threaded or Flanged</td>
<td>ANSI Class 300 Bronze, Class 250 Cast Iron or Class 300 Ductile</td>
</tr>
<tr>
<td>Triple Duty</td>
<td>2½&quot; - 12&quot;</td>
<td>Flow Indication</td>
<td>Pump discharge isolation, check, and balancing</td>
<td>Bronze or Cast or Ductile Iron/Bronze</td>
<td>Flanged</td>
<td>ANSI Class 300 Bronze, Class 250 Cast Iron or Class 300 Ductile</td>
</tr>
<tr>
<td>Check</td>
<td>To 2&quot;</td>
<td>Silent</td>
<td>Pump discharge</td>
<td>Bronze or Stainless Steel/Bronze or Stainless Steel</td>
<td>Threaded or Flanged</td>
<td>ANSI Class 300</td>
</tr>
</tbody>
</table>
## WATER SERVICES:
### Maximum 400 psig at 250°F (Heating & Dual Temperature Systems)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim Body/Seat</th>
<th>Type of Connection</th>
<th>Minimum Pressure Rating/Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>2&quot; - 12&quot;</td>
<td>Silent Globe</td>
<td>Pump discharge</td>
<td>Cast or Ductile Iron or Steel /Bronze or Stainless Steel</td>
<td>Flanged</td>
<td>ANSI Class 250 Cast Iron, Class 300 Ductile or Steel</td>
</tr>
<tr>
<td>Check</td>
<td>14&quot; - 24&quot;</td>
<td>Silent Globe</td>
<td>Pump discharge</td>
<td>Ductile Iron or Steel /Bronze or Stainless Steel</td>
<td>Flanged</td>
<td>ANSI Class 300</td>
</tr>
<tr>
<td>Check</td>
<td>To 2&quot;</td>
<td>Swing</td>
<td>Piping</td>
<td>Bronze/Bronze</td>
<td>Threaded</td>
<td>ANSI Class 300</td>
</tr>
<tr>
<td>Check</td>
<td>2½&quot; - 12&quot;</td>
<td>Swing</td>
<td>Piping</td>
<td>Iron or Steel /Bronze or 13 Cr steel</td>
<td>Flanged</td>
<td>ANSI Class 250 Cast Iron, Class 300 Steel</td>
</tr>
<tr>
<td>Check</td>
<td>12&quot; - 24&quot;</td>
<td>Swing</td>
<td>Piping</td>
<td>Steel /13 Cr steel</td>
<td>Flanged</td>
<td>ANSI Class 300</td>
</tr>
<tr>
<td>Strainer</td>
<td>To 2&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Bronze/Stainless 1/16&quot; screen</td>
<td>Threaded</td>
<td>ANSI Class 300</td>
</tr>
<tr>
<td>Strainer</td>
<td>2½&quot; - 4&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Iron or Steel /Stainless 1/16&quot; screen</td>
<td>Flanged</td>
<td>ANSI Class 250 Cast Iron, Class 300 Steel</td>
</tr>
<tr>
<td>Strainer</td>
<td>5&quot; - 12&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Iron or Steel/Stainless 1/8&quot; screen</td>
<td>Flanged</td>
<td>ANSI Class 250 Cast Iron, Class 300 Steel</td>
</tr>
<tr>
<td>Strainer</td>
<td>14&quot; - 24&quot;</td>
<td>Y-type</td>
<td>ACVs, P&amp;F HXs</td>
<td>Steel /Stainless 1/8&quot; screen</td>
<td>Flanged</td>
<td>ANSI Class 300</td>
</tr>
<tr>
<td>Strainer</td>
<td>To 16&quot;</td>
<td>Suction Diffuser</td>
<td>Pump Inlet (non-reducing)</td>
<td>Ductile Iron or Steel/Stainless 5/32&quot; screen</td>
<td>Threaded (to 2&quot;) or Flanged</td>
<td>ANSI Class 300</td>
</tr>
</tbody>
</table>

### ALTERNATE PIPING METHOD (GROOVED JOINT) FOR WATER SERVICES:
### Maximum Service Rating of 230°F, with pressure as required for the systems (see standard valve tables)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim Body/Seat</th>
<th>Type of Connection</th>
<th>Maximum System Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### ALTERNATE PIPING METHOD (GROOVED JOINT) FOR WATER SERVICES:

Maximum Service Rating of 230F; with pressure as required for the systems (see standard valve tables)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim Body/Seat</th>
<th>Type of Connection</th>
<th>Pressure Rating/Maximum System Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball</td>
<td>1½&quot; -6</td>
<td>2-piece</td>
<td>Isolation or ATC 2-Position</td>
<td>DI (ASTM A-536)/Cr.-plated stem, ball TFE seats</td>
<td>Grooved</td>
<td>800 PSI/600 PSI</td>
</tr>
<tr>
<td>Ball</td>
<td>2&quot;</td>
<td>1-piece</td>
<td>Diverting (3-port) or ATC 2-Position</td>
<td>DI (ASTM A-395)/SS TFE</td>
<td>Grooved</td>
<td>600 PSI/450 PSI</td>
</tr>
<tr>
<td>Butterfly</td>
<td>2&quot;-12&quot;</td>
<td>General Service</td>
<td>Isolation or ATC 2-Position</td>
<td>DI (ASTM A-536 or 395)/DI/EPDM</td>
<td>Grooved</td>
<td>300 PSI (dead-end to full rating of valve)/230 PSI</td>
</tr>
<tr>
<td>Butterfly</td>
<td>2&quot;-12&quot;</td>
<td>General Service</td>
<td>Diverting</td>
<td>DI (ASTM A-536 or 395)/DI/EPDM</td>
<td>Grooved</td>
<td>300 PSI (dead-end to full rating of valve)/230 PSI</td>
</tr>
<tr>
<td>Butterfly</td>
<td>14&quot;-24&quot;</td>
<td>General Service</td>
<td>Isolation</td>
<td>DI (ASTM A-395)/SS/EPDM</td>
<td>Grooved</td>
<td>175 PSI (dead-end to full rating of valve)/150 PSI</td>
</tr>
<tr>
<td>Butterfly</td>
<td>14&quot;-24&quot;</td>
<td>General Service</td>
<td>Isolation</td>
<td>DI (ASTM A-395 or 536)/DI/EPDM</td>
<td>Grooved</td>
<td>300 PSI (dead-end to full rating of valve)/230 PSI</td>
</tr>
<tr>
<td>Balancing/ Shut-off</td>
<td>To 2&quot;</td>
<td>Flow Indication</td>
<td>Isolation and balancing</td>
<td>Ametal® Brass-Copper Alloy/EPDM</td>
<td>Sweat or Threaded</td>
<td>300 PSI/230 PSI</td>
</tr>
<tr>
<td>Balancing/ Shut-off</td>
<td>2½&quot;-12&quot;</td>
<td>Flow Indication</td>
<td>Isolation and balancing</td>
<td>DI (ASTM A-536)/EPDM</td>
<td>Flanged or Grooved</td>
<td>300 PSI/230 PSI</td>
</tr>
<tr>
<td>Tri-Service</td>
<td>2½&quot;-12&quot;</td>
<td>Flow Indication</td>
<td>Pump discharge isolation, check and balancing</td>
<td>DI (ASTM A-536)/DI/EPDM</td>
<td>Grooved</td>
<td>300 PSI/230 PSI</td>
</tr>
<tr>
<td>Check</td>
<td>2½&quot;-12&quot;</td>
<td>Silent</td>
<td>Pump Discharge</td>
<td>DI (ASTM A-395 or 536)/DI/EPDM</td>
<td>Grooved</td>
<td>300 PSI/230 PSI</td>
</tr>
</tbody>
</table>
## ALTERNATE PIPING METHOD (GROOVED JOINT) FOR WATER SERVICES:
Maximum Service Rating of 230°F; with pressure as required for the systems (see standard valve tables)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size</th>
<th>Type</th>
<th>Application</th>
<th>Body/Trim Body/Seat</th>
<th>Type of Connection</th>
<th>Pressure Rating/Maximum System Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>4&quot;-12&quot;</td>
<td>Silent</td>
<td>Pump Discharge</td>
<td>DI (ASTM A-395 or 536) DI/EPDM</td>
<td>Grooved</td>
<td>300 PSI/230 PSI</td>
</tr>
<tr>
<td>Check</td>
<td>2&quot;-4&quot;</td>
<td>Swing</td>
<td>Piping (Horizontal)</td>
<td>DI (ASTM A-536) SS/EPDM</td>
<td>Grooved</td>
<td>300 PSI/230 PSI</td>
</tr>
<tr>
<td>Check</td>
<td>14&quot;-24&quot;</td>
<td>Spring Assist Dual Check</td>
<td>Pump Discharge</td>
<td>DI (ASTM A-395) SS/EPDM</td>
<td>Grooved</td>
<td>230 PSI/200 PSI</td>
</tr>
<tr>
<td>Strainer</td>
<td>2&quot;-12&quot;</td>
<td>Y-Type</td>
<td>ACV’s, P&amp;F HXs</td>
<td>DI (ASTM A-395 or 536) /EPDM SS 1/16&quot; or 1/8&quot; screen</td>
<td>Grooved</td>
<td>300 PSI/230 PSI</td>
</tr>
<tr>
<td>Strainer</td>
<td>1½&quot;-12&quot;</td>
<td>T-Type</td>
<td>ACV’s, P&amp;F HXs</td>
<td>DI (ASTM A-395 or 536) /EPDM SS 1/8&quot; screen</td>
<td>Grooved</td>
<td>400 PSI/350 PSI</td>
</tr>
<tr>
<td>Strainer</td>
<td>14&quot;-24&quot;</td>
<td>T-Type</td>
<td>ACV’s, P&amp;F HXs</td>
<td>DI (ASTM A-395 or 536) /EPDM SS 1/8&quot; screen</td>
<td>Grooved</td>
<td>300 PSI/230 PSI</td>
</tr>
<tr>
<td>Strainer</td>
<td>3&quot;-12&quot;</td>
<td>Suction Diffuser</td>
<td>Pump Inlet (non-reducing)</td>
<td>DI (ASTM A-395)/EPDM SS 3/16&quot; screen with 20 mesh start-up sleeve</td>
<td>Grooved System x ANSI Class 150 Pump Flange</td>
<td>300 PSI/230 PSI</td>
</tr>
<tr>
<td>Strainer</td>
<td>14&quot;-24&quot;</td>
<td>Suction Diffuser</td>
<td>Pump Inlet (non-reducing)</td>
<td>DI (ASTM A-395)/EPDM SS 3/16&quot; screen with 20 mesh start-up sleeve</td>
<td>Grooved System x ANSI Class 150 Pump Flange</td>
<td>300 PSI/230 PSI</td>
</tr>
</tbody>
</table>

### 2.6 PIPING, EQUIPMENT, PANEL AND VALVE IDENTIFICATION

A. All piping, equipment, panels and valves furnished and/or installed under this Section of the Specifications including automatic temperature controls shall be identified with pipe markers, valve tags, and equipment name plates. Refer to Part 3 – IDENTIFICATION for materials and methods of installation.
2.7 PRESSURE GAUGES, THERMOMETERS AND ACCESSORIES

A. Pressure Gauges

1. Gauges shall be provided for equipment and piping as indicated. A thermometer and pressure gauge shall be provided on the supply and return mains of each water and glycol system.

2. Up to 7 feet above finished floor, provide 4½" diameter gauges; over 7 feet above finished floors, provide 6" diameter gauges, oriented for ease of reading.

3. Provide gauges having one percent of scale range accuracy, brass pipe and fittings, phosphor bronze bourdon tubes, beryllium copper bellows, 1/4-in. NPT male connection, stainless steel rack and pinion movement, micro adjustment for calibration, white dial and black figures, plastic lens, and threaded ring case. Provide minimum 2-inch long brass nipples, ball valves, snubbers for each gauge.

4. Gauge ranges to be selected so that normal operating range for a particular gauge will occur at approximately the midpoint of the total range, and so that under minimum and maximum conditions, damage to gauge will not occur.

5. Gauge Schedule: Provide at locations indicated on drawings. Shop drawing submittal package to include location, size of gauge and range.


7. Gauges on piping in all mechanical rooms shall be so placed as to be easily read from the floor without parallax.

B. Compound Gauges (based on Trerice No. 600C Series, 4-1/2" size)

1. Provide compound pressure gauges where the pressure readings could be below 0 psig. Gauge shall have cast aluminum case, black finish.

2. Ring shall be friction type, stainless steel, clear glass window, with white dial with black figures and gradations.

3. Pointer shall be adjustable, red tipped.

4. Bourdon tube shall be phosphor bronze soldered to socket and tip, socket shall be brass, 1/4" NPT.

5. Accuracy shall be ANSI B.40.1, Grade A, 1% of full scale over middle half of range, 2% of full scale over first and last quarter of range.

C. Thermometers and Wells

1. Separable well type, industrial thermometers of the type specified below. Provide stainless steel separable wells with extended neck to suit insulation thickness. Provide stems and wells to extend approximately to center of the pipe or maximum length of 12-inch for large pipe.
2. Provide thermometers having brass, cast aluminum-bronze or cast aluminum case with blue reading non-mercury and glass windows. Provide minimum 9-inch scales with black numbers and adjustable angle stem. Provide 1 percent accuracy at mid-range. Thermometers shall be as manufactured by Taylor Instrument Co., Ametek/U.S. Gauge Division, Ashcroft Inc., Marsh Instrument, Weiss, Weksler, Trerice, or approved equal.

<table>
<thead>
<tr>
<th>Service</th>
<th>Scale Range</th>
<th>Divisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilled Water</td>
<td>[0] to [120] °F.</td>
<td>1°F</td>
</tr>
<tr>
<td>Condenser Water</td>
<td>[0] to [120] °F.</td>
<td>1°F</td>
</tr>
</tbody>
</table>

D. P/T Test Plugs

1. Pressure/Temperature Test Plugs shall be nickel-plated brass body, with ½-inch NPS fitting and 2 self-sealing valve-type core inserts, suitable for inserting a 1/8-inch O.D. probe assembly from a dial-type thermometer or pressure gauge. Test plug shall have gasketed and threaded cap with retention chain and body of length to extend beyond insulation. Pressure rating shall be 500 psig.

2. Core Material: Conform to the following for fluid and temperature range:
   a. Water, minus 30 deg to 275 deg F (minus 35 to 136 deg C): EPDM.

3. Test Kit: Provide test kit consisting of 2 pressure gauges, gauge adapters with probes, 2 bimetal dial thermometers, and carrying case.

4. Ranges of pressure gauges and thermometers shall be approximately 2 times systems operating conditions.

5. Manufacturers: Peterson Equipment (Pete’s Plug), Sisco (A Spedco Co.), Trerice, Watts Regulator, or approved equal.

2.8 MOTORS, DRIVES AND STARTERS

A. All equipment shall be provided complete with motors and drives, unless otherwise indicated.

B. Motors shall be Premium Efficiency (as available by size/speed/horsepower) and shall conform to NEMA Standards and shall be suitable for load, duty service and location. Motors shall have nameplates giving manufacturer’s name, serial number, horsepower, efficiency, speed and current characteristics. Motors shall be Century “E+3”, General Electric “Energy Saver Premium”, Reliance “Premium Energy Efficient” Series, Baldor “Super Premium Efficiency”, or approved equal.

C. Motors shall be tested in accordance with the standards of ANSI C50 and conform therewith for insulation resistance and electric strength. Minimum
efficiency levels shall be as listed in latest edition of ANSI/ASHRAE Standard 90.1 or the state’s energy code, whichever is higher. All motors shall be tested in accordance with IEEE Standard 112, Test Method B. Provide on nameplate the type of bearing grease to use.

D. Motors for use with variable frequency drives (VFD) shall be inverter duty rated and labeled, meet NEMA MG-1 Part 31, and have a minimum Class F or H insulation. All VFD motors shall have AEGIS™ or approved equal Shaft Ground Rings to prevent electrical bearing damage from capacitively coupled shaft voltages. For motors up to 100 HP, ring shall be installed on either the drive end or non-drive end. Motors over 100 HP shall have ring installed on the drive end of the motor with an insulated bearing on the non-drive end to prevent circulating currents. If rings are not factory installed, Contractor shall install them in the field following manufacturer’s requirements and, to start factory warranty, shall register them with AEGIS™ in the Owner’s name. Failure to install or register the rings will require Contractor to take on the responsibility of providing a 15 year warranty and to replace any failed motor bearings during the 15 year period.

E. Motors ½ HP and larger shall be squirrel cage induction, ball or roller bearings with pressure grease lubrication, specifically wound for the scheduled voltages.

F. Motors less than ½ HP shall be capacitor start of split phase type, specifically wound for 120V/1PH/60HZ alternating current, unless otherwise noted. Fractional horsepower motors, integral to equipment intended for installation in finished public spaces, shall be provided with an overload device responsive to motor current. The device shall be integral to the motor and include a wired, concealed, NEMA rated disconnect switch.

G. Motors shall be furnished complete with conduit terminal box of size adequate to accommodate conduits and wires as sized on the Electrical Drawings or specified under this Section.

H. Motor capacity shall be sufficient to operate associated driven devices under conditions of operation and load and with overload and at least the horsepower indicated or specified. All motors shall be of the premium efficiency, high power factor, low energy consuming type most suitable for the application and installed environment. Any motor replacement necessary for compliance to the application shall be at no additional cost to the Owner.

I. Motors shall be suitable for continuous duty at rated horsepower with temperature rise not to exceed 40°C for drip proof motors, 50°C for splash proof motors, 55°C for totally enclosed or explosion proof motors. All non-VFD motors shall be capable of 15% overload without overheating and suitable for operation for the ambient conditions of its specific location.

J. Direct connected motors shall be furnished with adjustable base. Motors connected to driven equipment by belt or shaft shall be furnished with adjustable
sliding bases, except fractional HP motors, which shall have slotted mounting holes.

K. Drives for belted motors shall be as manufactured by Dodge Manufacturing Company, Browning Manufacturing Company, T.B. Woods Company or equal with adjustable motor sheaves and adjustable slide bases. The drive belts shall be as short as practicable. All fans and fan units shall be furnished with cogged-type triple V-belt drives, each sized for 150% of the design drive capacity. All multiple belt drives shall have matched sets of belts.

L. Where starters or variable speed drives are not integral with packaged equipment specified in this section, the Electrical Subcontractor shall furnish all starters and drives in accordance with Division 26 drawings and specifications.

M. For packaged equipment, motor controllers shall be equipped with all poles, auxiliary contacts and other devices necessary to permit the interlocking and control sequences required. Controller operating coils shall be generally designed for 120 volt operation, and 3 phase motors shall be provided with thermal overload protection in all phases.

N. All electrical apparatus furnished under this Section shall be approved by UL (or other agencies approved by the authority having jurisdiction) and shall be labeled or listed where such is applicable. Where custom-built equipment is specified and the UL label or listing is not applicable to the completed product, all components used in the construction of such equipment shall be labeled or listed by UL where such is applicable to the component.

2.9 BASEBOARD RADIATION

A. Finned Tube Radiation

1. Furnish and install a complete system of baseboard radiation where shown on the drawings. Size, type, capacity and performance to be as scheduled on the drawings. Fin tube radiation to be similar and equal in all respects to Sterling Versaline. Alternate manufacturer’s, providing they are equal to the specified model are, Slant Fin, Vulcan, Trane, Ritting, Dunham-Bush or equal.

2. In general, the system shall have full backplate, flat-top enclosure, ball bearing cradle type element hangers, roller bearing type supply and return pipe hangers, access doors at all valves, end covers, wall sleeves, inside corners and outside corners. Enclosure shall be continuous between walls or shall be furnished with end covers.

3. Enclosure shall be of a flat-top type. Material to be minimum 14 gauge cold rolled steel. Enclosure shall be reinforced with welded gussets across the louvered area. Joining of enclosure sections shall be by slip joints to provide rigidity. Brackets shall be die formed for rigidity, and must be designed to support the full backplate at the top as well as at the front corners.
skirt of the enclosure. Brackets shall incorporate a security lock for fastening the enclosure, and to prevent removal of enclosure without tools. All enclosures and accessories shall be chemically phosphatized before priming with baked-on primer. Final coat shall be baked-on enamel. Color to be selected by the Architect. All accessories shall be die formed minimum 18 gauge cold rolled steel with beaded or flanged edges. Access doors with hex head camlock operator shall be provided at all valves. No sheet metal screws, or other fastenings or joining devices shall be visible when enclosure is installed.

4. Heating elements shall be copper tube/aluminum fins or steel tube/steel fins as scheduled. Element shall be rated at 240 PSI at temperatures up to 300°F.

5. Backplate shall be full dimension style, die formed of minimum 18 gauge cold rolled steel. It shall allow for removal of enclosure without damaging the wall. Install with high temperature open cell polyurethane dirt seal gasket along entire length of backplate.

6. Hangers for heating elements shall be, die formed, 14 gauge galvannealled steel with channel type wiped edge for rigidity Nickel-chromium plated ball bearings inserted into a nylon isolator insert shall be used in conjunction with a 18 gauge die-formed element support cradle to provide friction free lengthwise movement of element during expansion and contraction as well as aligning element to prevent contact with bracket, wall or enclosure. Hangers shall also provide for vertical adjustment.

7. Dampers shall have rolled edges for rigidity with knob operator.

8. Hangers for supply and return piping within the enclosure shall be of the roller bearing type to allow for noiseless expansion.

2.10 VIBRATION ISOLATION AND SEISMIC RESTRAINTS

A. General

1. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements:
   a. Ability to accommodate relative seismic displacements of supported item between points of support.
   b. Ability to accommodate the required seismic forces.

2. For each respective set of anchor bolts provide calculations to verify adequacy to meet combined seismic-induced sheer and tension forces.

3. For each weldment between structure and item subject to seismic force, provide calculations to verify adequacy.

4. Restraints shall maintain the restrained item in a captive position without short circuiting the vibration isolation.
5. Seismic restraint shall be installed in accordance with the State Building Code. As a minimum provide:
   a. Maximum distance between braces in the lateral direction shall be 30 feet for piping 2” and smaller and 40’ for piping 2-1/2” and larger.
   b. Maximum distances between braces in the longitudinal direction shall be 80 feet.
   c. Flexible couplings shall be provided within 12” of floor and wall non-breakable penetrations and within 24” of all building expansion joints.
   d. Hangers closest to the sway bracing shall be installed with an extended rod to the piping to resist upward movement of the piping.
   e. Lateral sway bracing shall not be required on piping supported with rods less than 6” long.

6. Seismic bracing for lateral and longitudinal bracing may be of the splayed wire (tension type), or pipe and fixed hanger (tension/compression type), and shall be complete with manufacturer’s recommended sizing, locations, and calculations. One system only (tension or compression/tension) shall be installed.

7. C clamps for attachment to the building structure must be provided with retaining straps.

8. 4-Way bracing may be of the splayed wire type or fixed angle brace with U-bolt.
   a. All vibration isolators shall be the product of a single approved manufacturer or as manufactured by an individual mechanical equipment manufacturer.
   b. Model numbers hereinafter specified are from Mason Industries. Other equivalent units by Consolidated Kinetics, Vibration Mountings and Controls or equal are acceptable.

B. Fan Coil Units
   1. Steel spring and 0.3” deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.
   2. Mason Model DNHS, 1” deflection.

C. Ductwork
   1. The first five hanger locations on the discharge side of each AHU and HV unit shall be provided with double deflection neoprene hangers.
2. Mason Model HD or WHD.

D. Flexible Connectors

1. Provide 2 foot long fire retardant flexible hoses for water piping to and from fan coil units, and elsewhere as shown on drawings. Hoses shall be rated for a minimum of 300 psig with 1200 psig burst pressure with a minimum operating temperature range of 0°F to 200°F. Hoses shall have stainless steel braid over EPDM or corrugated stainless steel liner. Threaded hose connectors shall be permanently crimped or welded with swivels that have self actuating fiber gaskets. Hose kits may be used providing all valves and components are arranged per the details shown on the drawings and the components meet the applicable specification section (such as Valves, etc.). Install hoses to allow for a minimum 1” pipe expansion or equipment movement in any direction. Hoses (and or hose kits), providing they meet these specifications, shall be by FDI, Hays, Trane or approved equal.

2.11 DUCTWORK

A. Reference Standards

1. Material, construction and installation shall meet applicable requirements of the current editions (unless otherwise shown) of the following standards and references, unless more stringent requirements are specified or shown on the Drawings (such as hazardous exhaust systems):

<table>
<thead>
<tr>
<th>Standard</th>
<th>As Applicable to</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMACNA HVAC Duct Construction Standards (Metal and Flexible, 2005)</td>
<td>Sheet Metal Ductwork; Duct Liners; Adhesives; Fasteners; Flexible Ductwork</td>
</tr>
<tr>
<td>SMACNA HVAC Air Duct Leakage Test Manual</td>
<td>Duct Leakage Testing</td>
</tr>
<tr>
<td>NFPA 90A</td>
<td>Fire Dampers; Fire Resistance Standards for Ducts and Liners</td>
</tr>
<tr>
<td>SMACNA Guidelines for Welding Sheet Metal</td>
<td>Welded Galvanized, Black Iron and Stainless Steel Ductwork</td>
</tr>
</tbody>
</table>

B. General

1. Provide all required supporting and hanging devices to attach entire HVAC system including ductwork and equipment, and to prevent vibration. Include vertical and horizontal supports as required by codes to meet minimum applicable earthquake resistance standards.

2. Ductwork shall be free from vibration at all times.
3. No pipe, conduit, hanger, Architectural element or structural member shall pass through duct without Engineer’s written approval. Where the pipe or conduit cannot possibly be relocated and when written approval has been obtained, increase duct size to maintain full cross-sectional area at point of interference. Provide streamlined enclosure for pipe or conduit, per SMACNA.

4. All offsets and transformations necessary due to structural conditions shall maintain the full cross-sectional area of ductwork shown on Drawings.

C. Ductwork Pressure Class, Seal Class, and maximum design velocities shall be as shown on the drawings and as specified herein.

D. Duct Construction

1. Unless otherwise specified, use the pressure classifications for the types of ductwork as shown on the drawings.

2. Non-welded duct seals and joints shall be as listed by SMACNA or Ductmate for the specified pressure and seal classes.

3. Material: Unless otherwise specified or shown on drawings, all ductwork shall be fabricated from 304 stainless steel.

4. Round ductwork shall be furnished where shown or called for on the drawings, and may be substituted for rectangular, except for shower exhaust, as an option to the Sheet Metal Sub Subcontractor when approved by the engineer, it can be easily fit in the available space and is round duct and fittings shall be of spiral lockseam construction.

5. Elbows and Bends:

   a. Wherever possible, all elbows and bends for rectangular ducts shall be full radius (centerline radius of 1.5 times duct width). Turning vanes and mitered elbows are not allowed.

   b. Where centerline radius must be less than 1.5 times duct width in the plane of bend, elbows shall be minimum 2" inside (not centerline) radius throat with radius heel and full length splitter vanes installed as shown on drawings or per SMACNA. Splitter vanes are not required on bends less than 30°. When centerline radius \( r \) divided by the duct width \( w \) is less than 1.5, provide the following number of splitter vanes:

   \[
   \begin{array}{ccc}
   \frac{r}{w} & \text{No. of Vanes for Elbow Angle of} & \text{No. of Vanes for Elbow Angle of} \\
   & 45° - 90° & 30° - 44° \\
   1.49 - 0.70 & 1 & 0 \\
   0.69 - 0.60 & 2 & 1 \\
   \text{Under} - 0.60 & 3 & 2 \\
   \end{array}
   \]
c. For round ductwork provide stamped elbows, with centerline radius equal to 1-1/2 times duct diameter, or sealed, gored elbows as follows:

<table>
<thead>
<tr>
<th>Elbow Angle</th>
<th>No. of Gores</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 36</td>
<td>2</td>
</tr>
<tr>
<td>37 – 72</td>
<td>3</td>
</tr>
<tr>
<td>73 – 90</td>
<td>5</td>
</tr>
</tbody>
</table>

d. Elbows for flat oval ducts shall have centerline radius equal to 1-1/2 times duct diameter in plane of bend, or sealed, gored elbows with gores as specified above for round ducts.

6. Transitions: Diverging air flow transitions shall be made with each side pitched out a maximum of 15 degrees, for an included angle of 30 degrees. Transitions for converging air flow shall be made with each side pitched in a maximum of 30 degrees, for an included angle of 60 degrees, or shall be as indicated. Factory-fabricated reducing fittings for systems using round duct sections when formed to the shape of the ASME short flow nozzle, need not comply with the maximum angles specified.

7. Metallic Flexible Duct: Metallic flexible type duct shall be two-ply aluminum or single ply stainless steel, self-supporting to 8-foot spans. Duct shall be of corrugated/interlocked, folded and knurled type seam construction, bendable without damage through 180 degrees with a throat radius equal to 1/2 duct diameter. Duct shall conform to UL 181 and shall be rated for positive or negative working pressure of 15 inches water gauge at 350 degrees F when duct is aluminum, and 650 degrees F when duct is galvanized steel or stainless steel.

8. Insulated Nonmetallic Flexible Duct Runouts: Flexible duct runouts shall be used only where indicated. Runout length shall be as shown on the drawings, but shall in no case exceed 4 to 6 feet. Runouts shall be preinsulated, factory fabricated, and shall comply with NFPA 90A and UL 181. Either field or factory applied vapor barrier shall be provided. Where coil induction or high velocity units are supplied with vertical air inlets, a streamlined and vaned and mitered elbow transition piece shall be provided for connection to the flexible duct or hose. The last elbow to these units, other than the vertical air inlet type, shall be a die-stamped elbow and not a flexible connector. Insulated flexible connectors may be used as runouts. The insulated material and vapor barrier shall conform to the requirements of this specification 230001, (Insulation paragraph). The insulation material surface shall not be exposed to the air stream.

9. General Service Duct Connectors: Flexible duct connectors approximately 6 inches in width shall be provided where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For round/oval ducts, the flexible material shall be secured by stainless steel or zinc-coated, iron clinch-type draw bands. For rectangular ducts, the flexible material locked to metal collars shall be installed using normal duct construction methods. The composite
connector system shall comply with NFPA 701 2004 (Standard of Methods of Fire Tests for Propagation of Textiles and Film) and be flame retardant.

E. Ductwork Accessories

1. Access Doors shall be rated for the duct pressure class they are installed in. Minimum gauge shall be the same as the duct.
   a. Frame: same materials as duct with seal
   b. Door: hinged, with exterior (and, for insulation ducts, interior) panel.
   c. Locks: doors 16" and under, one lock doors over 16", two locks
   d. Seals: foam gaskets for ultra-low leakage
   e. Insulation (for insulation ducts): ½" foam board with aluminum foil face, 0.12K at 75°F.
   f. Manufacturer: Ruskin, Inland Steel, Miami Carey or approved equal.

2. Access Door Sizes (unless indicated on drawings):

<table>
<thead>
<tr>
<th>Duct width (inches)</th>
<th>Access door size (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=10</td>
<td>10 x 6</td>
</tr>
<tr>
<td>12 - 16</td>
<td>12 x 8</td>
</tr>
<tr>
<td>Over 16</td>
<td>18 x 24</td>
</tr>
</tbody>
</table>

3. Provide at all air inlets, motorized dampers, air flow switches, where specified for cleanouts and where shown on the drawings.

   a. Manual volume dampers shall be provided where shown on the Drawings at every branch take off from the main duct, and elsewhere as required by the Balancing Sub Subcontractor, and shall be single or multiple blade type with sleeve bearings, interlocking blades and frame shall be of the same material as the ductwork. In ducts over 15” deep provide multiple opposed blade type, gang operated dampers with a maximum blade width of 8”. Damper blades shall be fabricated of 16 gauge steel with hemmed edges, and a maximum length of 48”. Damper operating rod shall be full blade length extended through the duct to externally mounted bearing plates. On insulated ductwork, bearing plates shall be installed flush with insulation finish and fastened to the duct. Operating lever shall be of the indicating type with locking quadrant. The integral dampers in
diffusers and grilles, other than where these are directly attached to the mains, shall not be used for balancing.

b. For dampers in inaccessible locations, such as above gypsum ceilings provide remote cable actuated dampers.

5. Backdraft Dampers

a. Back draft dampers shall be provided where indicated and required, and shall consist of a set of externally adjustable counter weighted louvers that open automatically due to excess pressure and prevent reverse flow. The edges of the blades shall be provided with seals to prevent rattling and minimize air leakage. The damper blades shall be supported on metal frames designed for wall mounting as indicated. The dampers shall be rated for operation up to a minimum of 2,500 fpm and be standard catalog products of Ruskin, Vent Products, American Warming and Ventilating or approved equal.

6. Air Deflectors and Branch Connections

a. Air deflectors shall be provided at duct mounted supply outlets, at takeoff or extension collars to supply outlets, at duct branch takeoff connections, and at 90 degree elbows, as well as at locations as indicated on the drawings or otherwise specified. Conical branch connections or 45 degree entry connections may be used in lieu of deflectors or extractors for branch connections. All air deflectors, except those installed in 90 degree elbows, shall be provided with an approved means of adjustment. Adjustment shall be made from easily accessible means inside the duct or from an adjustment with sturdy lock on the face of the duct. When installed on ducts to be thermally insulated, external adjustments shall be provided with stand-off mounting brackets, integral with the adjustment device, to provide clearance between the duct surface and the adjustment device not less than the thickness of the thermal insulation. Air deflectors shall be factory-fabricated units consisting of curved turning vanes or louver blades designed to provide uniform air distribution and change of direction with minimum turbulence or pressure loss. Air deflectors shall be factory or field assembled. Blade air deflectors, also called blade air extractors, shall be approved factory fabricated units consisting of equalizing grid and adjustable blade and lock. Adjustment shall be easily made from the face of the diffuser or by position adjustment and lock external to the duct. Stand-off brackets shall be provided on insulated ducts and are described herein. Fixed air deflectors, also called turning vanes, shall be provided in 90 degree elbows.

7. Blankoff Plates
a. Any blankoff plates or conversions required for mounting control dampers or coils shall be the responsibility of the Sheet Metal Sub Subcontractor.

8. Test Openings
   a. Provide instrument test opening enclosures in the ductwork at the discharge of each fan and fan coil, inlet of each fan and fan coil, and where directed by the Balancing Sub Subcontractor. The enclosures shall be installed before the application of the insulation and shall be of the proper height to extend beyond the insulation. The attachment of the test opening enclosure shall be made airtight.

9. Flexible connections shall be 6" wide connections constructed of heavy glass fabric double coated with neoprene. Flexible connections shall meet the requirements of the National Board of Fire Underwriters.

10. Duct Clean Out Doors - Provide clean out doors, for all horizontally installed ductwork and at each length of straight duct run. Provide access door constructed of same material as duct work served. Provide two hand operated plastic knobs with threaded brass inserts for opening and tight sealing of the door. Clean out doors shall be as specified for access doors.

F. Duct Sleeves, Framed Prepared Openings, Closure Collars
   1. Duct Sleeves
      a. Duct sleeves shall be provided for round ducts 15 inches in diameter or less passing through floors, walls, ceilings, or roof, and installed during construction of the floor, wall, ceiling, or roof. Round ducts larger than 15 inches in diameter and square, rectangular, and oval ducts passing through floors, walls, ceilings, or roof shall be installed through framed prepared openings. The Contractor shall be responsible for the proper size and location of sleeves and prepared openings. Sleeves and framed openings are also required where grilles, registers, and diffusers are installed at the openings. Framed prepared openings shall be fabricated from 20 gauge galvanized steel, unless otherwise indicated. Where sleeves are installed in bearing walls or partitions, black steel pipe, ASTM A 53, Schedule 20 shall be used. Sleeve shall provide 1 inch clearance between the duct and the sleeve or 1 inch clearance between the insulation and the sleeve for insulated ducts.

   2. Framed Prepared Openings
      a. Openings shall have 1 inch clearance between the duct and the opening or 1 inch clearance between the insulation and the opening for insulated ducts.

   3. Closure Collars
a. Collars shall be fabricated of galvanized sheet metal not less than 4 inches wide, unless otherwise indicated, and shall be installed on exposed ducts on each side of walls or floors where sleeves or prepared openings are provided. Collars shall be installed tight against surfaces. Collars shall fit snugly around the duct or insulation. Sharp edges of the collar around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier. Collars for round ducts 15 inches in diameter or less shall be fabricated from 20 gauge galvanized steel. Collars for round ducts larger than 15 inches and square, and rectangular ducts shall be fabricated from 18 gauge galvanized steel. Collars shall be installed with fasteners on maximum 6 inch centers, except that not less than 4 fasteners shall be used.

G. Bird Screens and Frames
   1. Bird screens shall conform to ASTM E 437, Type I, Class 1, 2 by 2 mesh, 0.063 inch diameter aluminum wire or 0.031 inch diameter stainless steel wire. Frames shall be removable type either stainless steel or extruded aluminum.

2.12 FLOOR GRILLES
   A. Stainless Steel Custom Fabricated Floor Grilles: Supply and return floor Grilles shall be TITUS model CT-480 (or approved equal) with 1/8-inch thick fixed bars at 0° deflection, spaced 1/4-inch on center. Grilles shall be available in standard one-piece and shall have the sizes and mounting types shown on the on drawing schedules. Grille lengths greater than 6 feet shall be furnished in multiple sections and will be joined together end-to-end with alignment strips or pins to form a continuous appearance. All alignment components to be provided by the manufacturer.

   The grille core shall have extruded 304 stainless steel bars locked into a heavy extruded 304 stainless steel border. The deflection bars must be fixed and parallel to the long dimension. The core must have support bars located no more than 9 inches apart and shall be parallel to the short dimension.

   Floor models of the diffuser shall have heavy duty mounting frames (frame type 6) and removable cores for easy access. The core support bars shall be located no more than 6 inches apart and shall be parallel to the short dimension for added strength.

   Heavy gauge extruded 304 stainless steel end borders and mitered corners shall be available to close off the ends of the diffusers. Minimum 304 stainless steel gauge thickness shall be 11 gauge.
The manufacturer shall provide published performance data for the linear bar diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

2.13 AIR FILTERS

A. Air filters shall be listed according to requirements of UL 900.

B. The HVAC contractor shall furnish a minimum of 3 additional complete sets of filters for all air handling equipment using filters. In addition to the filters furnished with each piece of equipment from the manufacturer, the HVAC Subcontractor shall provide a minimum of two complete sets of filters to be used during the construction and then the testing and balancing period. Finally, a complete new set of filters shall be installed upon substantial completion of the project, prior to final acceptance by the Owner’s Representative.

C. Extended Surface Pleated Panel Filters: Filters shall be 2 inch depth, sectional, disposable type of the sizes indicated and shall have an average efficiency rating of MERV-8 when tested according to ASHRAE 52.2 and shall maintain that rating as the filter goes from clean to dirty. This maintenance of the MERV-8 rating shall be documented shall be by testing according to Appendix J of ASHRAE 52.2. Initial resistance at 400 feet per minute shall not exceed 0.2 inches water gauge. Filters shall be UL Class 2. Media shall be nonwoven cotton and synthetic fiber mat. A wire support grid bonded to the media shall be attached to a moisture resistant fiberboard frame. All four edges of the filter media shall be bonded to the inside of the frame to prevent air bypass and increase rigidity. Filter shall be equal to Farr 30/30.

2.14 FAN COIL UNITS

A. Base units shall include galvanized coil casing, coil assembly drain pan, air filter, fans, motor, fan drive, and motor switch, plus an enclosure for cabinet models and casing for concealed models. Leveling devices integral with the unit shall be provided for vertical type units. Sound power levels shall be as indicated. Sound power level data or values for these units shall be obtained according to test procedures based on ARI 350. Sound power values apply to units provided with factory fabricated cabinet enclosures and standard grilles. Values obtained for the standard cabinet models will be acceptable for concealed models without separate test provided there is no variation between models as to the coil configuration, blowers, motor speeds, or relative arrangement of parts. Automatic valves and controls shall be provided as shown on drawings and specified in the ATC/BAS controls specification section. Each unit shall be fastened securely to the building structure. Capacity of the units shall be as indicated. Room fan-coil units shall be certified as complying with ARI 440, and shall meet the requirements of UL 1995.
B. Enclosures shall be fabricated of not lighter than 18 gauge steel, reinforced and braced. Front panels of enclosures shall be removable and provided with 1/2 inch thick dual density fibrous glass insulation. The exposed side shall be high density, erosion-proof material suitable for use in air streams with velocities up to 4,500 fpm. Discharge grille shall be [adjustable] [integrally stamped] and shall be of such design as to properly distribute air throughout the conditioned space. Plastic discharge and return grilles are acceptable provided the plastic material is certified by the manufacturer to be classified as flame resistant according to UL 94 and the material shall comply with the heat deflection criteria specified in UL 1995. Ferrous metal surfaces shall be galvanized or factory finished with corrosion resistant enamel. Access doors or removable panels shall be provided for piping, electrical, and control compartments. Duct discharge collar shall be provided for concealed models. Enclosures shall have easy access for filter replacement.

C. Fans shall be galvanized steel or aluminum, multiblade, centrifugal type. In lieu of metal, fans and scrolls may be non-metallic materials of suitably reinforced compounds. Fans shall be dynamically and statically balanced. Surfaces shall be smooth. Assemblies shall be accessible for maintenance. Disassembly and re-assembly shall be by means of mechanical fastening devices and not by epoxies or cements.

D. Coils shall be constructed of not less than 3/8 inch outside diameter seamless copper tubing, with copper or aluminum fins mechanically bonded or soldered to the tubes. Coils shall be provided with not less than 1/2 inch outside diameter flare or sweat connectors, accessory piping package with thermal connections suitable for connection to the type of control valve supplied, and manual air vent. Coils shall be tested hydrostatically at 300 psi or under water at 250 psi air pressure and suitable for 200 psi working pressure. Provisions shall be made for coil removal.

E. Drain pans shall be sized and located to collect all water condensed on and dripping from any item within the unit enclosure or casing. Drain pans shall be constructed of not lighter than 21 gauge aluminum or 304 stainless steel, thermally insulated to prevent condensation. Insulation shall have a flame spread rating not over 25 without evidence of continued progressive combustion, a smoke developed rating no higher than 50, and shall be of a waterproof type or coated with a waterproofing material. Drain pans shall be double pitched drain for positive drainage. Minimum 3/4 inch NPT or 5/8 inch OD drain connection shall be provided in drain pan. Provide an auxiliary drain pan to catch any overflow from the primary drain pan. Auxiliary pan may be plastic; if metal, the auxiliary pans shall comply with the requirements specified above. Provide a water detector in the auxiliary pan wired to close the chilled water control valve and have an alarm contact for the BAS.

F. Filters shall be minimum MERV-8 (70% minimum arrestance per ASHRAE 52.1), constructed of the fiberglass or synthetic disposable type, 1 inch thick,
conforming to CID A-A-1419. Filters in each unit shall be removable without the use of tools.

G. Motors shall be permanent split-capacitor type with built-in thermal overload protection, directly connected to unit fans. PSC motor switch shall be two or three speeds and off, manually operated, and shall be mounted on an identified plate inside the unit below or behind an access door or as indicated. Motors shall have permanently-lubricated or oilable sleeve-type or combination ball and sleeve-type bearings with vibration isolating mountings suitable for continuous duty. Motors shall have integral resettable thermal overload protection. Provide integral, prewired, concealed, and NEMA rated disconnect.

2.15 FACTORY PAINTING

A. Units which are not of aluminum, stainless steel, or galvanized construction (according to ASTM A 123 or ASTM A 525) shall be factory painted with a corrosion resisting paint finish. Internal and external ferrous metal surfaces shall be cleaned, phosphatised and coated with a paint finish which has been tested according to ASTM B 117, ASTM D 1654, and ASTM D 3359. Evidence of satisfactory paint performance for a minimum of 125 hours for units to be installed indoors and 500 hours for units to be installed outdoors shall be submitted. Rating of failure at the scribe mark shall be not less than 6, average creepage not greater than 1/8 inch. Rating of the inscribed area shall not be less than 10, no failure. On units constructed of galvanized steel which have been welded, exterior surfaces of welds or welds that have burned through from the interior shall receive a final shop docket of zinc-rich protective paint according to ASTM D 520 Type I.

2.16 INSULATION

A. Scope: Provide all labor, equipment, materials and accessories, and perform all operations required, for the correct installation of insulation on the following systems and all other necessary items connected into the systems subject to condensation, loss of heat, or personnel protection (above 120 degrees F):

1. Piping insulation (other than pre-insulated underground piping), jackets and accessories (including all valves and fittings with easily removable sections for maintenance of strainers, balance valves, and unions).
2. Ductwork insulation, jackets, and lining (including all fittings).

B. Environmental Requirements: Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

C. Quality Assurance: Insulation materials must be asbestos free, UL listed, and manufactured at facilities certified and registered to conform to ISO 9000 Quality
Standard. All insulating products and jackets shall carry a 25/50-flame spread/smoke developed rating as tested in accordance with ASTM E 84.

D. Workmanship: All insulation shall be installed by a licensed applicator and applied in accordance with the manufacturer’s recommendations. All work shall comply with all applicable federal, state, and local codes including, but not limited to, OSHA. All work shall conform to industry and trade accepted standards for commercial and industrial insulations. Verify that piping, heat trace, and ductwork has been tested (including applicable pressure/leakage tests) before applying insulation materials. Surfaces to be insulated shall be cleaned free of dirt, scale, moisture, oil and grease. No vapor barrier leaks or insulation voids will be accepted. Continue insulation vapor barrier through penetrations except where prohibited by code. All fire rated walls and penetrations shall be sealed with fire stopping. Locate insulation and cover seams in least visible locations. Neatly finish insulation at supports, protrusions, and interruptions. For all systems requiring a vapor barrier seal all terminations including fittings, wall penetrations, and supports with vapor barrier mastic such as Foster 30-65, Childers CP-35 or approved equal. In addition, in brine or chilled water pipe systems vapor seal pipe terminations every four pipe sections, using Foster 30-65, Childers CP-35 or approved equal. Bevel and seal ends of insulation at equipment, flanges, and unions. Where insulation is used over stainless surfaces, the material shall be chlorine free.

E. Delivery and Storage of Materials

1. Deliver all materials to the job site and protect the insulation against dirt, water, chemical and mechanical damage before, during and after installation. Do not install damaged insulation and remove it from the job site.

2. Deliver insulation, coverings, cements, adhesives coatings etc. to the site in factory-fabricated containers with the manufacturer’s stamp or label affixed showing fire hazard ratings of the products, name of manufacturer and brand.

3. Installed insulation that has not been weatherproofed shall be protected from inclement weather by an approved waterproof sheeting installed by the Contractor. Any water-damaged insulation shall be removed and replaced by the Contractor at no additional cost.

F. Manufacturers: Johns Manville (JM), CertainTeed, Owens-Corning, 3M, Armstrong, Knauf, or approved equal. Note that the listed manufacturers may not be able to supply all the insulation products required for the project. Unless otherwise noted, JM insulation products are listed to provide the minimum standards required for each type of insulation.

G. Pipe Insulation: Provide the following products depending on temperature of each system. Insulation shall be marked to show the locations of all unions, break flanges, strainers, check and balancing valves.
1. For piping with a service temperature between 40°F and 600°F such as hot water, provide glass fiber insulation equal to JM Micro-Lok. Insulation shall be rigid molded and noncombustible, meeting ASTM C 547, Type I. K-factor shall be 0.23 at 75°F mean temperature. All-purpose vapor retardant jacket shall be JM AP-T PLUS. A breather mastic for applications above ambient pipe service temperatures (fittings, tees, valves, etc.) shall be water based Foster 46-50 or Childers CP-10 / CP-11. A rigid, non-compressible insulation, equal to Pittsburg-Corning FoamGlas or KingspanTarec Kooltherm shall be used at all pipe hangers and supports for all steel chilled water piping where the pipe is supported by hangers, anchors, and guide with a minimum length of 18 inches.

H. Minimum pipe insulation thicknesses shall be as shown on the drawings.

I. Field Applied Piping and Fitting Jackets

1. Provide covers for insulation of all pipe fittings (i.e. elbows, tees, end caps, reducers, unions, flanges, mechanical joints), strainers and valves with surface temperatures between –20°F and 150°F (all water systems with glass fiber insulation). Provide easily removable sections for cleaning and maintenance of unions, balancing valves, and strainers. Fitting covers shall be 30-mil thick white PVC equal to JM Zeston 2000 molded high impact, UV resistant covers. Attach with water-resistant pressure sensitive color matching vinyl tape to maintain vapor barrier. Insulate all fittings per manufacturer’s recommendations to prevent surface temperature from exceeding the 150°F limit.

2. Other than where foam type insulation is used on up to 1” outdoor pipe, with 2 coats of UV protection, protect all piping insulation that passes through walls and floors, all outdoor pipe insulation, mechanical room pipe insulation (all within 7 feet of floor) and elsewhere where called for on drawings with 0.016 inch thick smooth or embossed aluminum sheet jacket or 0.01 inch thick smooth or corrugated type 304 stainless steel or 30 mil thick Zeston 2000 perma-weld high impact UV resistant PVC jacket with perma-weld fitting covers. Seams shall be on the bottom half of the pipe arranged to shed water. Provide minimum 2-inch overlap for all longitudinal and transverse joints. All seams of outdoor jacket shall be filled with waterproof adhesive. Provide 1” wide draw bands (same material as jacket) on 12” centers.

J. Ductwork Insulation – General

1. Provide duct and plenum insulation of type(s) indicated in these specifications. Minimum total R-value for each location and duct system shall be as shown on the drawings.

2. R-values shown on drawings may be obtained by adding the individual R-values of both the lining (where shown or used) and external duct insulation.
K. Ductwork Insulation (External Wrap) - General

1. Where duct is internally lined (coordinate locations with ductwork sub-
   Contractor), exterior insulation is not required unless called for in the
   specifications, shown on the plans, or where required to provide the
   minimum R-value shown on the drawings.

2. Where ducts are insulated or lined, flexible connectors to equipment shall
   be insulated. Duct flanges and standing seams shall be insulated the
   same as the duct.

3. Where service access is required, bevel and seal ends of easily removable
   insulation. Removable sections shall also be provided (and labeled) at all
   duct test holes.

4. The underside of duct work 24" or greater shall be secured with
   mechanical fasteners and speed clips spaced approximately 18" on
   center. The protruding ends of the fasteners should be cut off flush after
   the speed clips are installed, and then, when required, sealed with UL
   listed tapes or vapor-retardant adhesive.

5. For exterior rectangular ductwork, insulation shall be a minimum of 2
   inches thick (or thicker if required to meet the R-value) and shall be
   covered with a self-adhering double layer (aluminum facing with high-
   density polyethylene base) waterproofing membrane, such as MFM Flex-
   Clad 400, Venture Tape Corp. VentureClad 1577CW, Foster 62-05 Vapor
   Fas or equal. Color shall be as selected by Architect (aluminum, white,
   gray, or tan). Provide tapered closed cell foam type insulation for
   outdoor ductwork to insure no pooling of water on top of duct. Outdoor
   round ductwork shall be weatherproofed with the same material, or,
   alternatively, in the same manner as outdoor piping with a minimum of 2
   inch thick insulation thick (or thicker if required to meet the R-value).

L. Ductwork Insulation (External Wrap): Provide the following insulation types for the
   listed ductwork.

1. Insulate concealed ducts and plenums, depending upon the required R-
   value (see drawings) for the duct and its location, with 0.75 lb/cu ft dense
   fiber glass insulation equal to JM Microlite or Owens Corning SOFTR Type
   75. Insulation shall meet ASTM C 1290 Type III, flexible blanket with a
   maximum K-factor of 0.30 at 75°F mean temperature. Operating service
   temperature range shall be 40°F to 250°F. Vapor barrier jacket shall be
   FSK aluminum foil reinforced with fiberglass scrim laminated to UL rated
   kraft paper with maximum permeance of 0.02 perms. Jacket shall be
   secured with UL listed pressure sensitive tape and/or outward clinched
   expanded staples (with minimum 2 inch lapped vapor barrier) and vapor
   barrier mastic as needed. K-factors and R-values listed assume 25% compression during installation. The minimum R-value based on thickness, shall be:

<table>
<thead>
<tr>
<th>Thickness</th>
<th>R-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Insulate exposed ducts and plenums, depending upon the required R-value (see drawings) for the duct and its location, with 3.0 lb/cu ft dense fiber glass insulation. Insulation shall be equal to JM Type 814 Spin-Glas or Owens Corning Type 703 meeting ASTM C 612, Type 1A & 1B; rigid board with a maximum K-factor of 0.23 at 75°F mean temperature. Operating service temperature range shall be 0°F to 450°F. Vapor barrier jacket shall be AP type (kraft paper bonded to aluminum foil, reinforced with fiber glass yarn) with maximum permeance of 0.02 perms. Jacket shall be secured with UL listed pressure sensitive tape and/or outward clinched expanded staples (with minimum 2 inch lapped vapor barrier) and vapor barrier mastic as needed. The minimum R-value, based on thickness, shall be:

<table>
<thead>
<tr>
<th>Thickness</th>
<th>R-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½&quot;</td>
<td>4.2</td>
</tr>
<tr>
<td>2&quot;</td>
<td>5.6</td>
</tr>
<tr>
<td>3&quot;</td>
<td>8.3</td>
</tr>
</tbody>
</table>

M. Duct Liner: Provide flexible duct liner equal to JM Permacote Linacoustic (rectangular duct) or Spiracoustic (round duct) meeting ASTM C 1071 with K-factor shall be 0.25 (1" thick) at 75°F mean temperature when tested per ASTM C 518. Liner shall have an air surface coated with acrylic coating treated with EPA register anti-microbial agent proven to resist microbial growth as determine by ASTM G 21 and G 22. Noise reduction coefficient shall be minimum 0.65 for 1" thick liner or higher for thicker liner based on type “A” mounting and tested in accordance to ASTM C 423. Install liner with full coverage adhesive meeting ASTM C 916 equal to Foster 85-00/85-60, Childers CP-82 or JM SuperSeal. Secure liner with galvanized steel pins, welded or mechanically fastened. Weld pins shall not mar the exterior finish or surface of the duct. Liner shall be attached to pin with pressed on washer. Mechanical liner fasteners shall be spaced as indicated by SMACNA, NAIMA, or manufacturer. Pin length should be such as to limit compression of liner. All exposed edges of the liner must be factory or field coated. The minimum R-value, based on thickness, shall be:

<table>
<thead>
<tr>
<th>Thickness</th>
<th>R-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>4.0</td>
</tr>
<tr>
<td>1 ½&quot;</td>
<td>6.0</td>
</tr>
<tr>
<td>2&quot;</td>
<td>8.0</td>
</tr>
</tbody>
</table>

2.17 AUTOMATIC TEMPERATURE CONTROLS

A. Automatic Temperature Controls shall be as specified herein.
B. All bidders must be building automation Contractors in the business of installing direct digital control building automation systems for a minimum of 10 years. Bidder must have an office within 50 miles of the job site staffed with factory-trained engineers capable of trouble shooting and maintaining all systems for the project. All bidders must be authorized distributors or branch offices of the manufacturers specified.

C. All bidders must have a trained staff of application engineers, who have been certified by the manufacturer in the configuration, programming and service of the automation system. The Installer shall have successfully completed the Control Systems Manufacturer’s classes on the control system he is to install. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request. All systems design and programming shall be done by the bidder’s staff and not subcontracted to a third party.

D. Acceptable Vendors: The below listed vendors are acceptable providing they meet the requirements of these specifications. Any proposed deviations from these specifications or drawings shall be highlighted in the bid form or attached proposal and agreed to in writing by the Owner and Engineer prior to acceptance of the bid. No deviations will be allowed after that time. The BAS shall be by:

1. Johnson Controls
2. Invensys
3. Honeywell

E. The above list of manufacturers applies to Webserver, controllers, software, custom application programming language, Building Network Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (e.g., sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

F. The BMS shall be compatible with and shall integrate flawlessly into the existing campus wide Johnson Controls Metasys system.

G. Scope of Work

1. Except as otherwise noted, the control system shall consist of all Building Network Controllers, Custom Application Controllers, Application Specific Controllers, Webserver, routers, software, sensors, transducers, relays, control valves, control dampers, valve and damper operators, control panels, and other accessory equipment to fully provide all required control functions. Provide a complete system of electrical interlock wiring to fill the intent of the specification and provide for a complete and operable system. Except as otherwise specified, provide operators for
equipment such as dampers if the equipment manufacturer does not provide these. Coordinate requirements with the various Contractors.

2. Provide all required software and hardware to interface with the existing front end operator’s workstation and alarm printer, including displaying of all graphics.

3. The BAS Contractor shall review and study all HVAC drawings and all mechanical and electrical specifications to familiarize him with all equipment and sequences. BAS Contractor shall provide all the required quantities and types of devices necessary to completely perform all sequences, whether or not such devices are explicitly shown on the drawings or specified. If any devices are not specified they shall be of the same high quality of specified components.

4. The BAS Contractor shall hire licensed electricians and shall provide all required interlock wiring and wiring of all control devices including sensors, control valves and damper actuators, control panels, etc. Scope of wiring includes the provision of additional required power wiring beyond what is shown on the electrical drawings. Any additional wiring required from electric panels shall be coordinated with the Division 16 electrical Contractor and paid for by the BAS Contractor. All wiring shall comply with the requirements of the electrical section of these specifications.

5. When the BAS system is fully installed and operational, the BAS Contractor and representatives of the Owner will review and check out the system and train the Owner’s personnel. At that time, the BAS Contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications. The BAS Contractor shall carry 40 hours of additional on-site programming to allow for field modifications that may be needed to optimize the various systems to fully conform to the requirements of these specifications and work with the actual operating conditions as installed.

6. The building is to be commissioned and Contractor shall provide all labor required to fully test and demonstrate that all systems operate as designed.

7. The Contractor shall furnish and install a complete building automation system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. At a minimum, provide controls for the following:

   a. Graphics, reports, trending, alarms and occupancy (occupied, unoccupied and warm-up/cool-down) schedules as appropriate for all equipment, including tie-in of existing operator’s workstation.

   b. Interface with controls provided by equipment manufacturers.
c. Supply, make-up air, and exhaust air handling units.
d. Supply, exhaust and return air fans.
e. Condensing units and condensers.
f. Air-conditioning units.
g. Heating and ventilating units.
h. Pumps.
i. Hot water heating systems.
j. Chilled water systems.
k. Interface with lighting controls (including exterior lighting).
l. Variable volume and constant volume boxes/valves (including fan powered boxes) including heating coils.
m. Cabinet and unit heaters.
n. Carbon dioxide, carbon monoxide, and refrigerant detection.
o. Filters.
p. Monitoring points for packaged equipment such as computer room units (via BACnet, Modbus or LonWorks), chemical feed equipment, glycol feed pumps, etc.
q. Interface with plumbing equipment for water heater combustion air damper interlocks and failure alarms such as water booster pumps, ejector pumps, etc.
r. Monitoring points for fire alarm system signals, FOP (Firefighter’s Override Panel) switches and pilot lights, etc.
s. Monitoring points for building services such as generator status, natural gas usage, etc.
t. Power and control wiring to all DDC devices, equipment interlocks, control valves and dampers, BAS panels, etc.
u. All other equipment scheduled or shown on drawings
v. Proposed O&M Manual Table of Contents.
w. O&M Manuals
x. Proposed acceptance testing plan, test forms, reports and narratives.
y. All completed acceptance testing documentation and report of successful completion of the required 30 day performance test. This is a separate submission prior to job completion.

z. Subcontractor Project Completion Certificate for the control system. See “Project Closeout” for requirements. This is a separate submission prior to job completion.

8. Provide services and manpower necessary for testing of system in coordination with the HVAC Contractor, Balancing Contractor and Owner’s representative and in accordance with the acceptance testing plan and functional performance test narratives.

9. All work performed under this section of the specifications shall comply with all codes, laws and governing bodies. If the drawings and/or specifications are in conflict with governing codes, the Contractor shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this specification and associated drawings exceed governing code requirements, the specification will govern. The Contractor shall obtain and pay for all necessary construction permits and licenses.

H. System Description

1. The Building Automation System (BAS) shall consist of Webserver based microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions. The intent is for the BAS to seamlessly connect devices throughout the building, regardless of sub-system type. Gateways shall not be used unless there is no other solution for systems integration.

2. For this project the system shall consist of the following components:

   a. Webserver: The BAS shall function as a Webserver to allow an operator to view and/or modify any point in the system via the Internet and/or the Owner’s Intranet (coordinate this with the Owner). HTML pages shall be capable of being accessed via any computer connected to the Internet and/or company Ethernet backbone via standard Internet browser software after confirmation of authorized user name and password. Provide a firewall for the BAS network. Systems requiring any version of the workstation software loaded on the accessing computer shall not be acceptable.

   b. Ethernet-based Building Network Control Units (BNCU): The BAS Contractor shall furnish Ethernet-based Building Network Controllers as described in Part 2 of the specifications. These controllers shall connect directly to the Webserver over Ethernet,
provide communication to all Custom Application Controllers, Application Specific Controllers, Input/Output Modules, and serve as a communication link to equipment furnished by others (if applicable).

c. Custom Application Controllers (CAC):

1) Provide the necessary quantity and types of Custom Application Controllers to meet the requirements of the project for control of the designated mechanical equipment. All controllers shall be seamlessly integrated utilizing the same network and the same programming language.

2) Each controller shall be completely programmable and provide functionality based on I/O configuration rather than application. For example, the Custom Application Controllers shall have the ability to provide local lighting control.

3) Each CAC shall operate completely standalone, containing all of the I/O (including 15% spare points of each type) and programs to control its associated equipment.

d. Application Specific Controllers (ASC):

1) Provide the necessary quantity and types of Application Specific Controllers to meet the requirements of the project for control of the designated equipment. All controllers shall be seamlessly integrated utilizing the same network and the same programming language.

2) Each ASC shall be capable of executing the required sequences of operation and provide the I/O point capacity and types as indicated on the drawings.

3) Each ASC shall operate completely standalone, containing all of the I/O and programs to control its associated equipment.

e. Portable Service Tool: Provide one portable service tool (or portable computer if required) for monitoring and testing of the BNCUs, CACs, and ASCs. The portable service tool will be for use by the Balancing Contractor. The portable service tool shall be returned to the BAS Subcontractor upon completion of the project.

I. Work by Others
1. The BAS Contractor shall cooperate with other Contractors performing work on this project necessary to achieve a complete and neat installation. To that end, each Contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others’ work.

2. The BAS Contractor shall furnish all control dampers (not furnished by equipment manufacturers), control valves, sensor wells, flow meters and other similar equipment for installation by the Mechanical Contractor.

3. The BAS Contractor shall provide field supervision to the designated Contractor for the installation of the following:
   a. Control dampers and valves.
   b. Blank-off plates for dampers that are smaller than duct size.
   c. Air and water flow monitoring stations.
   d. Sheet metal baffle plates to eliminate stratification.
   e. Location of all sensor wells and tappings in all piping and duct systems.

4. The Electrical Contractor shall provide:
   a. All power wiring to HVAC equipment and motors, heat trace, and to junction boxes (for control power) in mechanical rooms, where shown on the electrical drawings. Where available, all control power shall be on the standby generator.
   b. Furnish smoke detectors and wire to the building fire alarm system. HVAC Contractor to mount devices. BAS Contractor to hardwire to fan shut down and BAS alarm.
   c. Contact(s) from fire alarm system for opening of elevator shaft vent damper(s) for wiring by BAS Contractor.
   d. Firefighter’s Override Panel (FOP) with switches and pilot lights for wiring by BAS Contractor to provide On-Off-Auto control of smoke control system(s) and air handling unit(s) including opening/closing the appropriate dampers and providing status through the pilot lights.
   e. Contact(s) from standby generator(s) for status of power (normal verses standby), day tank(s) and fuel oil pump set(s) for wiring to the control system by the BAS Contractor.
   f. Contact(s) from electric system for building power usage (for demand limiting).
J. Code Compliance

1. Provide BAS components and ancillary equipment, which are UL-916 listed and labeled.

2. All equipment or wiring used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke/Fuel contribution rating of 25/50/0 and all applicable building codes or requirements.

3. All wiring shall conform to the National Electrical Code and the Division 16 specifications – whichever is more stringent.

4. All smoke dampers shall be rated in accordance with UL 555S.

5. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.


7. Components used for both HVAC and Smoke Management Systems shall be UL-864 listed and labeled. Components used for smoke control shall be supervised and listed for fire alarm service per NFPA. All such control panels shall be located in building life safety electric rooms, coordinate exact locations with the electrical Contractor.

K. Submittals

1. All shop drawings shall be prepared in both hard copy and electronic form (in a standard format such as AutoCAD 2000 or newer, or Visio Professional). In addition to the drawings, the Contractor shall furnish a CD containing the identical information. Drawings shall be B size or larger. See Submittals Paragraph for additional requirements. Upon request, RDK Engineers will provide via email the CADD floor plan drawings for use by the BAS Contractor. The drawings are diagrammatic and final floor plans and equipment locations are the responsibility of the BAS Contractor.

2. Shop drawings shall include a riser diagram and floor plans depicting locations of all controllers, routers, hubs, Web servers, etc., with associated network architecture and wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller. “Typicals” will be allowed where appropriate. Wiring diagrams detailing interconnecting devices such as fan and pump starters, freeze stats, smoke detectors, relays, etc., shall be provided for each system. Written narratives for all sequences shall be included. Any deviations from the original design shall be highlighted. A “Bill of Materials” list shall be provided for each system indicating part numbers, descriptions, manufacturer, and quantities of each component utilized.
3. Submittal data shall contain manufacturer's data sheets on all hardware and software products required by the specification and sequences. Valve, damper, and airflow station schedules shall indicate size, type, configuration, capacity, maximum pressure rating, pressure drop, maximum differential pressure shut-off capabilities, and name and location of all equipment served.

4. Software submittals shall contain narrative descriptions of sequences of operation, program listings, point lists, and a complete description of the graphics, reports, trends, alarms and configuration to be furnished with the Webserver software. Provide complete information on user programming (commands, sequences, etc.). Information shall be bound or in a three ring binder with an index and tabs.

5. Submit six (6) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor shall check all documents for accuracy prior to submitting.

6. The Engineer will make corrections, if required, and return to the Contractor. The Contractor shall then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

7. No work may begin on any segment of the project until submittals have been successfully reviewed for conformity with the design intent of the project.

8. Identification labels and tags, including database for equipment, valves, panels, and devices.


10. O&M Manuals

11. Start-up and acceptance plan, narratives, test forms, and report containing all completed forms, tests, and report of the required successful completion of the 30 day performance test.

12. Subcontractor’s Project Completion Certificate.

L. System Startup and Acceptance Testing

1. Each point in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS shall be tested against the appropriate sequence of operation. Successful completion of the system test shall constitute the beginning of the warranty period. A written report shall be submitted (with copy to the Owner’s Representative) indicating that the installed system functions in accordance with the plans and specifications.
2. The BAS Contractor shall submit their acceptance testing plan, pre-functional performance test forms and narratives, and functional performance test forms and narratives. Unless a commissioning agent has been contracted the responsibility to facilitate the commissioning process, the BAS Contractor shall be responsible for coordinating the attendees needed to demonstrate the sequence of operation performance to the Owner. The controls system will not be accepted without the prior acceptance of the submitted documents noted herein.

3. The BAS Contractor shall test and set in operating condition all equipment and systems. For major equipment such as chillers, boilers, and air handling units, this shall be done in the presence of the equipment manufacturer’s representatives, as applicable, and the Owner and Architect’s representatives. Coordinate with all required attendees.

4. The BAS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor shall have a trained technician available on request during the balancing of the systems. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract.

M. Training

1. The BAS Contractor shall provide both on-site and classroom training to the Owner’s representative and maintenance personnel using the BAS acceptance testing documents.

2. On-site training shall include a minimum of 40 hours of hands-on instruction geared toward the operation and maintenance of the systems. Prior to training, the necessary lesson plans, training documents, handouts, etc. shall be provided with the curriculum outline, which shall include as a minimum:
   a. System Overview.
   b. Webserver usage, programming, graphics, alarms, notifications, etc.
   d. System Access.
   e. Software features overview.
   f. Changing set points and other attributes.
   g. Scheduling.
h. Editing programmed variables.

i. Displaying and editing color graphics.

j. Running reports and trending.

k. Application programming.

l. Operational sequences including start-up, shutdown, adjusting and balancing.

m. Equipment maintenance.

3. Classroom training shall include a minimum of (2) training slots (for different weeks) for factory course material covering webserver operation and controller programming.

N. Warranty

1. The BAS Contractor shall warrant the entire system (parts and labor) for 18 months after successful system acceptance testing is accepted by Owner’s Representative. Beneficial use by the Owner may be an alternative method to begin the warrantee period (providing there is a minimum of 12 months left after successful system acceptance testing and system acceptance by Owner’s Representative). During the warranty period, the BAS Contractor shall be responsible for all software and hardware upgrades and revisions during normal workday schedule, and within 48 hours of notification if solution cannot be resolved via the remote or web-site connection, to provide and maintain complete and workable building control systems.

2. Updates to the manufacturer’s software shall be provided at no charge during the warranty period.

O. System Architecture

1. The Building Automation System (BAS) shall consist of Building Network Control Units (BNCU) and associated Input/Output Unit Modules (I/O, as applicable), Custom Application Controllers (CAC), Application Specific Controllers (ASC), and Webserver. The BAS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility. The BAS shall have the capability to accommodate integration of and to other building sub-systems (fire alarm, security, card access, lighting, etc.) as indicated on the drawings and detailed in the specifications.

2. Level 1 Network Description (BAS Network):

   a. Level 1, the main backbone of the system, shall be an Ethernet (ISO/IEC 8802-3) LAN/WAN. Building Network Control Units and
Webserver shall connect directly to this network without the need for Gateway devices.

3. Level 2 Network Description (Field Bus Level)
   
a. Level 2 of the system shall consist of one or more field buses managed by the Building Network Control Units. The Level-2 field buses may consist of one or more of the following types:

   1) An RS-485 proprietary field bus (or “machine bus”) that supports up to 32 Input/Output Units (I/O) directly connected to a Building Network Control Unit. The I/O modules may be mounted within the BNCU or remotely mounted via a single twisted, shielded pair of wires.

   2) An RS-485 proprietary token-passing bus that supports a minimum 120 Custom Application Controllers or Application Specific Controllers.

   3) ANSI/ATA 878.1 Arcnet: Field bus utilizes RS-485 signaling. Both Custom Application Controllers and Application Specific Controllers may reside on this network bus (minimum of 60 devices).


   5) EIA-709.1, LonTalk: Field bus utilizing LonTalk FTT-10a network protocol over twisted pair wiring. Both Custom Application Controllers and Application Specific Controllers may reside on this network bus (minimum of 60 devices).

P. BAS Configuration

1. The BAS shall be capable of being segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN), sharing a single Webserver (10/100 megabits/sec Ethernet). This enables Webservers to manage a single LAN (or building), and/or the entire system with all devices being assured of being updated by and sharing the most current database.

2. All BNCUs and Webserver shall be capable of residing directly on the Owner’s Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the BNCU’s, Webserver shall be capable of using standard, commercially available, “off-the-shelf” Ethernet infrastructure components such as routers, switches and hubs. With this design the Owner may utilize the investment of an existing or new enterprise network
or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the Owner’s Information Systems department as all devices shall utilize standard TCP/IP components.

Q. Support For Open Systems Protocols

1. The BAS design shall include solutions for the integration of the following “open systems” protocols: ANSI/ASHRAE 135-2001 BACnet, EIA-709.1 LonTalk™, Modbus, OPC Client/Server, and digital data communication to third party microprocessors such as any equipment manufacturer’s controllers and variable frequency drives (VFDs).

   a. BACnet: The BAS shall, as a minimum, support the BACnet Interoperable Building Blocks (BIBBS) for Read (Initiate) and Write (Execute) Services as defined in the Data Sharing BIBBS as follows:

      - DS-RP-A, B
      - DS-RPM-A, B
      - DS-WP-A, B
      - DS-WPM-A, B

   b. LonTalk: The BAS shall support LonTalk communications using FTT-10 transceivers. All communications shall follow LonMark standards utilizing approved Standard Network Variable Types (SNVTs) and Standard Configuration Parameter Types (SCPTs). LonMark components which do not have a standard applicable profile must comply with LonMark standards, and be provided with a XIF file for self-documentation.

2. The system shall also provide the ability to program custom ASCII communication drivers, residing in the BNCU, for communication to third party systems and devices. These drivers shall provide real time monitoring and control of the third party systems.

R. Controller Standby Power Requirements

1. For every controller, regardless of type, that controls any smoke control life safety systems and all systems shown on their sequences as on standby power, provide an uninterruptible power supply (UPS) system capable of operating the controller and all associated I/O modules, routers, repeaters, etc. for at least 20 minutes.

2. Wire all these devices with standby (not normal) power. Coordinate locations with electrical Contractor.

S. Webserver Functionality
1. The BAS system on the Ethernet TCP/IP Internet and/or the Owner’s Intranet (coordinate availability with the Owner’s IT group) shall be setup as a seamless Webserver. The Webserver function shall be either built into the BAS hardware or be a separate fully integrated solid state Webserver hardware device. All user entered information (web pages, security, etc.) shall be stored in non-volatile memory. System operational information and clock functions shall be battery-backed or backed up automatically to another device for a minimum of 72 hours.

2. The Webserver shall have the ability to automatically obtain an IP (Internet Protocol) address using DHCP. Use of static IP addressing shall also be supported. The Webserver shall have the ability to store HTML code and “serve” pages to a web browser. This provides the ability for any computing device utilizing a TCP/IP Ethernet connection and capable of running a standard Internet browser (Microsoft Internet Explorer™, Netscape Navigator™, etc.) to access real-time data from the entire BAS. No additional software shall have to be installed on the client PC for normal operation of the system. An unlimited number of users shall be able to access the Webserver. A minimum of 15 users (expandable) shall be able to utilize this device at the same time.

3. Graphics (for all systems) and text-based web pages shall be constructed using standard HTML code. The interface shall allow the user to choose any of the standard text or graphics-based HTML editors for page creation. It shall also allow the operator to generate custom graphical pages and forms.

4. The Webserver interface shall be capable of password security, including validation of the requesting PC’s IP address. All communication with the Webserver shall be encrypted using 128 bit Secure Socket Layer (SSL) technology. The Webserver interface shall allow the sharing of data or information between any controller, or process or network interface (BACnet, LonTalk and TCP/IP) that the BAS has knowledge of, regardless of where the point is connected on the BAS network or where it is acquired from.

5. Operators with proper security shall be able to override set points, operation schedules, and equipment operation. These changes shall be made graphically within the web browser. A log of system alarms and events shall be able to be viewed from the web browser. Operators with proper security shall be able to acknowledge alarms. System trends shall be able to be selected and viewed. Trends shall be shown graphically with the proper axis scaling automatically selected. Operators with proper access shall be able to configure the webserver using their web browser.

6. To simplify graphic image space allocation, HTML graphic images, if desired, may be stored on any shared network device. The BAS Webserver shall have the ability to acquire any necessary graphics using
standard pathing syntax within the HTML code mounted within the BAS Webserver. Real-time values shall be updated automatically at least once every 30 seconds (with the option to switch to manual updates from the remote computer).

T. Building Network Control Units (BNCU)

1. General: Provide Level 1 Building Network Control Units to provide the performance specified in Part 1 of this Section. Each of these panels shall meet the following requirements.
   
   a. The Building Automation System shall be composed of one or more independent, stand-alone, microprocessor based BNCUs to manage the global strategies required by this project.
   
   b. The BNCUs shall have sufficient memory to support its operating system, database, a minimum of 3 days of buffer (for trending data), and programming requirements with 50% spare capacity.
   
   c. The BNCUs shall provide communications ports for connection of the Portable Computer and Portable Operators Terminal.
   
   d. The operating system of the BNCUs shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
   
   e. All BNCUs shall have battery-backed real time clocks.
   
   f. Data shall be shared between all BNCUs.
   
   g. Each BNCU shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
      
      1) Assume a predetermined failure mode.
      
      2) Generate an alarm notification.

2. Communications: Each Building Network Control Unit shall reside on the same Level 1 inter-network as the Webserver. The network shall be on ISO 8802-3 (Ethernet) and support the Internet Protocol (IP). This network shall be provided by the BAS Subcontractor and shall communicate with the Owner’s network as defined by the Owner’s IT department. Each BNCU shall also perform routing to a network of Level 2 Custom Application and Application Specific Controllers.

3. Environment: Controller hardware shall be suitable for the anticipated ambient conditions. Controllers used in conditioned ambient shall be mounted in an enclosure, and shall be rated for operation at 32°F to 120°F.
4. Serviceability: Provide diagnostic LEDs for power, communications, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.

5. Memory: The Controllers shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

6. Immunity to Power and Noise: Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage. The Controllers shall contain surge protection and not require any external AC power signal conditioning.

7. BNCU Operator Display: Controller (at least one in each location) shall include an operator display allowing the user to perform basic daily operations tasks on the building automation system. At a minimum this operator display shall:
   a. Be installed on the building controller or on the adjacent wall and require no additional power source.
   b. Consist of either a one-quarter VGA touch screen with 320 X 240-pixel resolution with adjustable brightness and the contrast or a minimum 2 line by 40 character LCD display with keypad.
   c. Be capable of having the same unique user identification and passwords as the associated controller to limit access to the system and operator functions.
   d. Display the current state of any input/output point and equipment controller (CAC or ASC) on the network.
   e. Give the operator the ability to override the current state of any output point or HVAC equipment controller (CAC or ASC) on the network.
   f. Allow the operator to modify the start and stop times of any time-of-day schedule within the system.
   g. Provide a visual indication that a system alarm exists.
   h. Provide the ability to view and acknowledge alarms that are annunciated at that BNCU.
   i. Allow the operator to view custom graphical displays with dynamic status information.
   j. Automatically update displayed system information every 10 seconds.
U. Custom Application Controllers (CAC)

1. General: Provide Level 2 Custom Application Controllers to provide the performance specified in Part 1 of this Section. Each of these panels shall meet the following requirements.

   a. The Building Automation System shall be composed of one or more independent, stand-alone, microprocessor based CACs to manage the local strategies required by this project.

   b. The CACs shall provide communications ports for connection of the Portable Computer and Portable Operators Terminal.

   c. The CACs shall have sufficient memory to support its operating system, database, a minimum of 3 days of buffer (for trending data), and programming requirements with 50% spare capacity.

   d. All CACs shall have battery-backed real time clocks.

   e. The operating system of the CACs shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.

   f. Each CAC shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:

      1) Assume a predetermined failure mode.

      2) Generate an alarm notification.

2. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

   a. Controllers used in conditioned ambient shall be mounted in NEMA 1 type enclosures, and shall be rated for operation at 32 F to 120 F.

   b. Controllers used outdoors and/or in wet ambients shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -30 F to 150 F.

3. CAC Operator Display: A local operator display (similar to that specified for BNCUs) shall be provided on at least one CAC or BNCU at each control panel location. The operator display shall be provided for interrogating and editing data. A system security password shall be available to prevent unauthorized use of the keypad and display.

4. Serviceability: Provide diagnostic LEDs for power, communications, and processor. All low voltage wiring connections shall be made such that the
controller electronics can be removed and/or replaced without disconnection of field termination wiring.

5. Memory: The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

6. Immunity to Power and Noise: Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. The Controllers shall contain surge protection and not require any external AC power signal conditioning.

V. Application Specific Controllers (ASC)

1. General: Provide Level 2 ASCs as required for this project. ASCs are microprocessor-based DDC controllers dedicated to control a specific piece of equipment. They shall be fully user programmable, initially set up to provide the specified sequences. Applications are limited to small HVAC equipment such as VAV and CV terminal units (including fan powered), Fan Coil Units, etc.

   a. Each ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.

      1) VAV and CV terminal unit controllers shall include damper actuators with minimum torque of 35 in-lb, with override for manual positioning during start-up and servicing. Velocity sensors shall have an accuracy of +/- 3% of full range.

   b. Each ASC shall contain sufficient I/O capacity (at least 1 spare point of each type), memory (at least 50% spare), and programming flexibility to control the target system and allow for future changes in programs remotely through the front end.

   c. The ASCs shall provide communications ports for connection of the Portable Computer and/or Portable Operators Terminal.

2. Environment: The hardware shall be suitable for the anticipated ambient conditions.

   a. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -30 F to 150 F.

   b. Controllers used in conditioned ambients shall be mounted in NEMA 1 type rated enclosures. Controllers located where they will not be disturbed by building activity (such as above ceiling grid), may be provided with plenum-rated enclosures and non-enclosed wiring connections for plenum cabling. Exception: Use NEMA 1 enclosures and provide conduit for all wiring for systems that
control any outdoor air dampers, or connect to the fire management or smoke control systems. All ambient controllers shall be rated for operation at 32 F to 120 F.

3. Serviceability: Provide diagnostic LEDs for power and communications. All wiring connections shall be clearly labeled and made to be field removable.

4. Memory: ASCs shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.

5. Immunity to Power and Noise: Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%.

6. Transformer: Power supply for the ASCs must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type with all wiring by the BAS Subcontractor.

W. Communications

1. This project shall comprise of an Ethernet network for communications between Building Network Control Units and Webserver.

2. The BAS Subcontractor shall provide all communication media, connectors, repeaters, hubs, and routers necessary for the controls system inter-network.

3. Remote operator interface via Webserver shall allow for communication with any and all controllers on this network.

4. Communications services over the inter-network shall result in operator interface and value passing that is transparent to the inter-network architecture as follows:

   a. Connection of an operator interface device to any one controller on the inter-network will allow the operator to interface with all other controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software, custom programs, etc., for all controllers shall be available for viewing and editing from any one controller on the inter-network.

   b. All database values (i.e., points, software variable, custom program variables) of any one controller shall be readable by any other controller on the inter-network. This value passing shall be automatically performed by a controller when a reference to a point name not located in that controller is entered into the controller’s database. An operator/installer shall not be required
to set up any communications services to perform inter-network value passing.

5. The time clocks in all controllers shall be automatically synchronized daily and automatically corrected for daylight savings time and leap years.

X. Input/Output Interface (I/O)

1. Hard-wired inputs and outputs may tie into the system through Building, Custom, or Application Specific Controllers.

2. All input points and output points shall be protected such that shorting of the point to itself, another point, or ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller. Provide a minimum of 15% spare I/O points of each type for BNCUs and CACs.

3. Binary (digital) inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 ma to be compatible with commonly available control devices.

4. Pulse accumulation input points. This type of point shall conform to all the requirements of Binary Input points, and also accept up to 2 pulses per second for pulse accumulation, and shall be protected against effects of contact bounce and noise.

5. Analog inputs shall allow the monitoring of low voltage (0-10 Vdc), current (4-20 ma), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with, and field configurable to commonly available sensing devices.

6. Binary (digital) outputs shall provide for on/off operation, or a pulsed low voltage signal for pulse width modulation control. Binary outputs on custom and building controllers shall have 3-position (on/off/auto) override switches and status lights. Outputs shall be selectable for either normally open or normally closed operation. The position of the override switches shall be monitored and any point in override shall be highlighted as such in all graphics.

7. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0-10 Vdc or a 4-20 ma signal as required to provide proper control of the output device. Analog outputs on building or custom controllers shall have status lights, a 2-position (auto/manual) switch, and manually adjustable potentiometer for manual override. The position of the override switches shall be monitored and any point in override shall be highlighted as such in all graphics.

Y. Portable Service Tool
1. Provide portable proprietary (or laptop) service tool to communicate directly to all controllers. If a laptop is required, the laptop software shall enable users to monitor both instantaneous and historical point data, modify control parameters, and enable/disable any point or program in any controller on the network. Provide all required hardware/software. The service tool (or laptop) shall be used by the balancing Contractor and then turned over to the Owner.

2. The laptop or service tool shall be able to connect to any Ethernet controller or standalone controller via a dedicated service port. From this single connection, the user shall be able to communicate with any other controller on the LAN.

3. The laptop or service tool shall limit operator access by passwords. The service tool must support, at a minimum, the following password-protected user types: Administrator, Modify Parameters, View Only.

4. The laptop or service tool software shall include built-in menus for viewing points by controller, enabling, disabling and viewing programs, configuring controllers, and communicating to other controllers on the network.

Z. System Software

1. General Description: The software architecture must be object-oriented in design, a true 32-bit application suite utilizing Microsoft’s OLE, COM, DCOM and ODBC technologies. These technologies make it easy to fully utilize the power of the operating system to share, among applications (and therefore to the users of those applications), the wealth of data available from the BAS. The functions shall include monitoring and programming of all DDC controllers. Monitoring consists of alarming, reporting, graphic displays, long term data storage, automatic data collection, and operator-initiated control actions such as schedule and set point adjustments. Programming of controllers shall be capable of being done either off-line or on-line. All information shall be available in graphic or text displays. Graphic displays shall feature visual effects to enhance the presentation of the data, to alert operators of problems, and to facilitate location of information throughout the DDC system. All operator functions shall be selectable through a mouse.

2. System Database: The files server database engine must be Microsoft SQL Server, or another ODBC-compliant, relational database program. This ODBC (Open Database Connectivity)-compliant database engine allows for an Owner to utilize “their” choice of database and due to its “open” architecture, allows an Owner to write custom applications and/or reports which communicate directly with the database avoiding data transfer routines to update other applications. The system database shall contain all point configurations and programs in each of the controllers that have been assigned to the network. In addition, the database will contain all
User Interface: The BAS software shall allow the creation of a custom, browser-style interface linked to the user that has logged into the software. This interface shall support the creation of “hot-spots” that the user may link to view/edit any object in the system or run any object editor or configuration tool contained in the software. Furthermore, this interface must be able to be configured to become a user’s “PC Desktop” – with all the links that a user needs to run other applications. This, along with the Windows user security capabilities, will enable a system administrator to setup workstation accounts that not only limit the capabilities of the user within the BAS software but may also limit what a user can do on the PC and/or LAN/WAN.

User Security: The software shall be designed so that each user of the software can have a unique username and password. This username/password combination shall be linked to a set of capabilities within the software, set by and editable only by, a system administrator. The sets of capabilities shall range from View only, Acknowledge alarms, Enable/disable and change values, Program, and Administer. The system shall allow the above capabilities to be applied independently to each and every class of object in the system. The system must allow a minimum of 250 users to be configured per workstation. There shall be an inactivity timer adjustable in software that automatically logs off the current operator after the timer has expired.

Configuration Interface: The software shall use a familiar Windows Explorer™-style interface for an operator or programmer to view and/or edit any object (controller, point, alarm, report, schedule, etc.) in the entire system. In addition, this interface shall present a “network map” of all controllers and their associated points, programs, graphics, alarms, and reports in an easy to understand structure. All object names shall be alphanumeric and use Windows long filename conventions. Object names shall not be required to be unique throughout the system. This allows consistency in point naming. For example, each ASC can have an input called Space Temperature and a set point called CFM Setpoint. The ASC name shall be unique such as VAV for LAB101. Systems requiring unique object names throughout the system will not be acceptable.

a. The configuration interface shall include support for template objects. These template objects shall be used as building blocks for the creation of the BAS database. The types of template objects supported shall include all data point types (input, output, string variables, set points, etc.), alarm algorithms, alarm notification objects, reports, graphics displays, schedules, and programs. Groups of template object types shall be able to be set up as template subsystems and systems. The template system shall prompt for data entry if necessary. The template system shall
maintain a link to all “child” objects created by each template. If a user wishes to make a change to a template object, the software shall ask the user if he/she wants to update all of child objects with the change. This template system shall facilitate configuration and programming consistency and afford the user a fast and simple method to make global changes to the BAS.

6. Color Graphic Displays: The system shall allow for the creation of user defined, color graphic displays for the viewing of mechanical systems and building schematics. These graphics shall contain point information from the database including any attributes associated with the point (engineering units, etc.). In addition operators shall be able to command equipment or change set points from a graphic through the use of the mouse. Requirements of the color graphic subsystem include:

a. SVGA, bit-mapped displays. The user shall have the ability to import AutoCAD generated picture files as background displays. As a minimum graphics shall include: all mechanical equipment including each individual air handling unit, fan, chiller, pump, boiler, heat exchanger, etc.; systems of equipment including chilled water system (chillers, pumps, heat exchangers, control valves, etc.), condenser water system (towers, pumps, chillers, heat exchangers, control valves, etc.); hot water system (boilers, heat exchangers, pumps, control valves, etc.); air handling systems (AHUs, ERUs, RTUs, associated fans, control dampers, etc.); clean rooms (all controls); animal rooms (all controls), etc.; floor plans showing equipment locations and visual indication of any rooms in alarm, with point and click selection of any room’s system.

b. A built-in library of objects such as dampers, fans, pumps, buttons, knobs, gauges, ad graphs which can be “dropped” on a graphic through the use of a software configuration “wizard”. Objects shall be set up so that it is easy to visually see the state of the object (such as fan on or off). These objects shall enable operators to interact with the graphic displays in a manner that mimics their mechanical equivalents found on field installed control panels. Using the mouse, operators shall be able to adjust set points, start or stop equipment, modify PID loop parameters, or change schedules.

c. Status changes or alarm conditions must be able to be highlighted by objects changing screen location, size, color, text, blinking or changing from one display to another.

d. Graphic panel objects shall be able to be configured with multiple “tabbed” pages allowing an operator to quickly view individual graphics of equipment, which make up a subsystem or system.
e. Ability to link graphic displays through user defined objects, alarm testing, or the result of a mathematical expression. Operators must be able to change from one graphic to another by selecting an object with a mouse - no menus will be required.

7. On-Line Help and Training: Provide a context sensitive, on line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. Provide an interactive tutorial CD, which will act as on-line training/help for the systems operator.

8. Automatic Monitoring: The software shall allow for the automatic collection of data and reports from any controller through either a hardwire or modem communication link. The frequency of data collection shall be completely user-configurable.

9. Alarm Management: The software shall be capable of accepting alarms directly from controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) will be integrated into the overall alarm management system and will appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.

a. Alarm management features shall include:

1) A minimum of 20 alarm notification levels. Each notification level will establish a unique set of parameters for controlling alarm display, acknowledgment, keyboard annunciation, alarm printout and record keeping.

2) Automatic logging in the database of the alarm message, point name, point value, connected controller, timestamp, username and time of acknowledgement, username and time of alarm silence (soft acknowledgement)

3) Automatic printing of the alarm information or alarm report to an alarm printer or report printer.

4) Playing an audible beep or audio (wav) file on alarm initiation or return to normal.

5) Sending an email, alphanumeric page, or phone call (by text to speech technology) to anyone listed in an email account address list on either the initial occurrence of an alarm and/or if the alarm is repeated because an operator has not acknowledged the alarm within a user-configurable timeframe. The ability to utilize email, phone
and alphanumeric paging of alarms shall be a standard feature of the software integrated with the operating system’s mail application interface (MAPI).

b. Individual alarms shall be able to be re-routed to a user or users at user-specified times and dates. For example, a critical high temp alarm can be configured to be routed to a Facilities Dept. user during normal working hours (7am-6pm, Mon-Fri) and to a Central Alarming user at all other times.

c. An active alarm viewer shall be included which can be customized for each user or user type to hide or display any alarm attributes.

d. The font type and color, and background color for each alarm notification level as seen in the active alarm viewer shall be customizable to allow easy identification of certain alarm types or alarm states.

e. The active alarm viewer can be configured such that an operator must type in text in an alarm entry and/or pick from a drop-down list of user actions for certain alarms. This ensures accountability (audit trail) for the response to critical alarms.

10. Custom Report Generation: The software shall contain a built-in custom report generator, featuring word processing tools for the creation of custom reports. These custom reports shall be able to be set up to automatically run or be generated on demand. Each user shall be able to associate reports with any word processing or spreadsheet program loaded on the machine. When the report is displayed, it will automatically spawn the associated report editor such as MS Word™, WordPerfect™, MS Excel™, or Lotus 123™.

a. Reports can be of any length and contain any point attributes from any controller on the network.

b. The report generator shall have access to the user programming language in order to perform mathematical calculations inside the body of the report, control the display output of the report, or prompt the user for additional information needed by the report.

c. It shall be possible to run other executable programs whenever a report is initiated.

d. Report Generator activity can be tied to the alarm management system, so that any of the configured reports can be displayed in response to an alarm condition.
e. Standard Reports: The following standard system reports shall be provided for this project. These reports shall be readily customized to the project by the Owner.

1) Points in each controller.
2) Points in alarm
3) Disabled points
4) Overridden points
5) Operator activity report
6) Alarm history log.
7) Program listing by controller with status.
8) Network status of each controller.
9) ASHRAE Guideline 22-2008 Report: Provide a daily report that shows the operating condition of each chiller as required by ASHRAE Guideline 22.

11. Spreadsheet-style reports: The software shall allow the simple configuration of row/column (spreadsheet-style) reports on any class of object in the system. These reports shall be user-configurable and shall be able to extract live (controller) data and/or data from the database. The user shall be able to set up each report to display in any text font, color and background color. In addition the report shall be able to be configured to filter data, sort data and highlight data which meets user-defined criteria.

12. Dynamic Graphical Charting: The operator shall be able to select system values to be charted in real time. A minimum of three values at one time can be selected for each chart. The type of chart (bar, line, 3-D, etc.) shall be user selectable.

13. HTML Reporting: The above reports shall be able to be run to an HTML template file. This feature will create an HTML “results” file in the directory of the HTML template. This directory can be shared with other computer users, which will allow those users with access to the directory to “point” their web browser at the file and view the report.

14. Clock Synchronization: The real time clocks in all building control panels shall be synchronized on command of an operator. The system shall also be able to automatically synchronize all system clocks; daily from any operator designated device in the system. The system shall automatically adjust for daylight savings and standard time if applicable and for leap years.
15. Scheduling
   
a. It shall be possible to configure and download schedules for any of the controllers on the network.

b. Time of day schedules shall be in a calendar style and shall be programmable for a minimum of one year in advance. Each standard day of the week and user-defined day types shall be able to be associated with a color so that when the schedule is viewed it is very easy, at-a-glance, to determine the schedule for a particular day even from the yearly view. To change the schedule for a particular day, a user shall simply click on the day and then click on the day type.

c. Each schedule will appear on the screen viewable as the entire year, monthly, week and day. A simple mouse click shall allow switching between views. It shall also be possible to scroll from one month to the next and view or alter any of the schedule times.

d. Schedules will be assigned to specific controllers and stored in their local RAM memory. Any changes made at the workstation will be automatically updated to the corresponding schedule in the controller.

16. Programmer's Environment: The programmer's environment will include access to a superset of the same programming language supported in the controllers. Here the programmer will be able to configure application software off-line (if desired) for custom program development, write global control programs, system reports, wide area networking data collection routines, and custom alarm management software. On the same screen as the program editor, the programming environment shall include dockable debug and watch bars for program debugging and viewing updated values and point attributes during programming. In addition a wizard tool shall be available for loading programs from a library file in the program editor.

17. Saving/Reloading: The software shall have an application to save and restore field controller memory files. This application shall not be limited to saving and reloading an entire controller – it must also be able to save/reload individual objects in the controller. This allows off-line debugging of control programs, for example, and then reloading of just the modified information.

18. Data Logging (Trends and Histories): The software shall have the capability to easily configure groups of data points with trend and history logs and display the trend log data. A group of data points shall be created by drag-and-drop method of the points into a folder. The trend and history log data shall be displayed through a simply menu selection. This data
shall be able to be saved to file and/or printed. The operator shall be able to define a custom trend and history log for any data in the system. This definition shall include interval, start-time, and stop-time. As a minimum, any point may be recorded at user selected intervals of 1, 5, 15, 30, and 60 minutes as well as once a shift (8 hours), once a day, once a week, once a month, or for change of value. Trend and history data shall be capable of being selected as either instantaneous at the time of recording or averaged between time intervals. All trends and histories shall start based on the hour. Each trend and history shall accommodate up to a minimum of 64 system objects. The system operator with proper password shall be able to determine how many samples are stored. Trend and history data shall be sampled and stored on the Building Controller and be archived on the hard disk monthly. BAS shall archive histories for a minimum of 18 months and shall prompt operator each January to archive each calendar year’s data on a CD. Trend and history data shall be able to be viewed and printed from the operator interface software. Trends and histories shall be viewable in a text-based format and graphically. They shall also be storable in a tab delimited ASCII format for use by other industry standard word processing and spreadsheet packages. BAS Contractor shall provide setup of custom histories as required for the listed reports.

19. Audit Trail: The software shall automatically log and timestamp every operation that a user performs from logging on and off to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.

20. Custom Application Programming: Provide the tools to create, modify, and debug custom application programming. The operator shall be able to create, edit, and download custom programs at the same time that all other system applications are operating. The system shall be fully operable while custom routines are edited, compiled, and downloaded. The programming language shall have the following features:

a. The language shall be English language oriented and be based on the syntax of programming languages such as BASIC. It shall allow for free form or fill in the blank programming. Alternatively, the programming language can be graphically-based using function blocks as long as blocks are available that directly provide the functions listed below, and that custom or compound function blocks can be created.

b. A full screen character editor/programming environment shall be provided. The editor shall be cursor/mouse-driven and allow the user to insert, add, modify, and delete code from the custom programming. It shall also incorporate word processing features such as cut/paste and find/replace.
c. The programming language shall allow independently executing program modules to be developed. Each module shall be able to independently enable and disable other modules.

d. The editor/programming environment shall have a debugging/simulation capability that allows the user to step through the program and to observe any intermediate values and or results. The debugger shall also provide error messages for syntax and execution errors.

e. The programming language shall support conditional statements (IF/THEN/ELSE/ELSE-IF) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

f. The programming language shall support floating point arithmetic using the following operators: +, -, /, x, square root, and xy. The following mathematical functions shall also be provided: natural log, log, absolute value, and minimum/maximum value from a list of values.

g. The programming language shall have pre-defined variables that represent clock time, day of the week, and date. Variables that provide interval timing shall also be available. The language shall allow for computations using these values.

h. The programming language shall have ability to pre-defined variables representing the status and results of the System Software, and shall be able to enable, disable, and change the values of objects in the system.

21. Demand Limiting: The demand limiting program shall monitor building power consumption from signals generated by a pulse generator (provided by others) mounted at the building power meter, or from a watt transducer or current transformer attached to the building feeder lines. The demand limiting program shall be based on a predictive sliding window algorithm. The sliding window duration and sampling interval shall be set equal to that of the local Electrical Utility. Control system shall be capable of demand limiting by resetting HVAC system set-points to reduce load while maintaining Indoor Air Quality (humidity, CO2) and comfort control in the space. Input capability shall also be provided for an end-of-billing period indication.

22. Maintenance Management: The system shall monitor equipment status and generate maintenance messages based upon user designated run time, starts, and/or calendar date limits.

23. PID Control: A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-wind-up shall be supplied. The algorithm shall calculate a time-varying analog value used to position an output or
stage a series of outputs. The controlled variable, set point, and PID gains shall be user-selectable with an option for auto-tuning. The set point shall optionally be chosen to be a reset schedule.

24. Staggered Start: This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts shall be user-selectable.

25. System Calculations: Provide software to allow instantaneous power (e.g. KW), flow rates (e.g. GPM) to be accumulated and converted to energy usage data. Provide an algorithm that calculates a sliding-window KW demand value. Provide an algorithm that calculates energy usage and weather data (heating and cooling degree days). These items shall all be available for daily, previous day, monthly and the previous month.

26. Anti-Short Cycling: All binary (digital) output points shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.

AA. DDC Sensors and Point Hardware

1. Temperature Sensors

a. All temperature devices shall use precision thermistors or RTDs accurate to +/- 1 degree F over a range of –30 to 230 degrees F. Space temperature sensors shall be accurate to +/- 0.5 degrees F over a range of 40 to 100 degrees F. Outdoor air temperature sensors shall be accurate to +/- 0.5 degrees F over a range of -20 to 110 degrees F.

b. Standard space sensors shall be available in an off white enclosure for mounting on a standard electrical box. Temperature sensor may be combined with humidity or carbon dioxide sensor in one housing providing it meets the specifications listed above.

c. Where manual overrides are required, the sensor housing shall feature both an optional means for adjusting the space temperature set point, as well as a push button for selecting after hours operation.

d. Where a local display is specified, the sensor shall incorporate either an LED or LCD display for viewing the space temperature, set point and other operator selectable parameters. Using built in buttons, operator shall be able to adjust set points directly from the sensor.

e. Duct temperature sensors shall incorporate a thermistor bead or RTD embedded at the tip of a stainless steel tube. Probe style duct sensors are useable in air handling applications where the
AHU or duct area is less than 12 square feet. Tube shall be long enough so that the sensor is at least 1/3 of the way into the air stream.

f. Averaging sensors shall be employed in AHU’s or ducts that are 12 square feet and larger. The averaging sensor tube must contain at least one thermistor or RTD for every 3 square feet of AHU or duct area. Sensors shall be accurate to +/- 0.5 F over their normal operating temperature range +/- a 20-degree margin. Example, for a heating/cooling air-handling unit that normally varies between 55 and 100 degrees F, the sensor shall have the stated accuracy over a range of 35 to 120 degrees F.

g. Immersion sensors employed for measurement of temperature in all chilled, condenser, glycol and hot water applications as well as steam and refrigerant applications shall incorporate a precision thermistor or RTD type sensor. “Smart” sensors (where called for) shall be RTD type and include either an LED or LCD display. Chilled water sensors shall be accurate to +/- 0.5 degrees F over their normal operating temperature range +/- a 20-degree margin. Condenser and hot water sensors shall be accurate to +/- 0.5 degrees F over their normal operating temperature range +/- a 20-degree margin. Example, for a hot water system that normally varies between 90 and 200 degrees F, the sensor shall have the stated accuracy over a range of 70 to 220 degrees F. Thermal wells shall be brass or stainless steel for non-corrosive fluids below 250 degrees F and 300 series stainless steel for all other applications.

h. Where BTU measurement is called for, the associated temperature sensors shall be matched and calibrated so they differ by no more than 0.2°F.

i. Outside Air Temperature Sensors: Utilize precision thermistor or RTD-type units. Sensors shall be designed to withstand the environmental conditions to which they will be exposed. Sensor enclosure shall allow for adequate air flow over the sensing element. Housing shall be NEMA-3R construction as a minimum.

2. Electric Thermostats

a. Provide low temperature thermostats (freezestats) as indicated on drawings. Low reading freezestats shall register alarm and be wired to shut down the associated fan system when temperature along any 1’ of element falls below set point. Manual reset shall be required. Provide 1’ of element for every square foot of coil face area. Minimum adjustable range shall be 34 to 46 degrees F with an initial set point of 38 degrees F, unless listed otherwise on the drawings.
b. Provide low voltage thermostats for control of single zone heating or air conditioning equipment as specified in the sequence of operation. Electric thermostats shall include a display of the current space temperature as well as a mechanism for adjusting the set point locally. Electric thermostats that control both heating and cooling shall be 7-day programmable with a minimum 5-degree dead band between the heating and cooling set points.

3. Humidity Sensors
   a. Humidity devices shall be thin film polymer type accurate to +/- 2% at full scale for space and +/- 2% for duct and outside air applications. Suppliers shall be able to demonstrate that accuracy is NIST traceable. Acceptable manufacturers include Vaisala, General Eastern or Staefa.
   b. Provide a hand held field calibration tool that both reads the output of the sensor and contains a reference sensor for ongoing calibration.

4. Pressure Sensors
   a. Air pressure measurements in ranges up to 0 to 10" water column will be accurate to +/- 1% of range using a solid-state sensing element. Select the smallest range applicable to the use of the sensor. Sensors shall be bi-directional for room pressure monitoring. Acceptable manufacturers include Ashcroft Inc., Modus Instruments, Setra and Mamac.
   b. Differential pressure measurements of liquids shall be accurate to +/- 0.5% of range. Housings shall be NEMA 4 rated.
   c. Provide wind baffles for outdoor pressure sensor locations and indoor locations where there can be turbulence.

5. Current Devices: Current devices shall be used to monitor fans, pumps, motors and electrical loads. Current devices shall be available in solid and split core models, and offer either a digital (switch for on-off status of constant speed equipment) or an analog (sensor for status of VFD driven equipment) signal to the automation system. Current switches shall be capable of differentiating between free-wheeling (belt breakage) and normal motor load. Acceptable manufacturers are Veris, Siemens, or approved equal.

   a. Provide where indicated insertion dual turbine flowmeters for measurement of liquid flows in pipe sizes above 2 inches. Below 2 ½" pipe, provide in-line type flow meters with isolation valves and manual bypass.
b. Install the insertion flow meters on isolation valves to permit removal without process shutdown.

c. Sensors shall be capable of reading velocities between 0.17 and 20 fps with +/- 2% accuracy above 0.4 fps, have local readout, and 4 to 20 mA or 0-10 volt output to the control system. Sensors shall be as manufactured by ONICON or approved equal.

d. Contractor shall ensure proper straight lengths of upstream (minimum 10 pipe diameters) and downstream (minimum 5 pipe diameters) pipe per manufacturer’s recommendations for the location chosen.

7. Airflow Measuring Stations

a. Minimum Outdoor Air

1) Provide either thermal dispersion velocity meters using biomedical grade self heated thermistor sensors with glass encapsulated thermistor temperature sensors or stainless steel outside reference sensor and inlet airflow sensor capable of measuring pressure drop across a fixed resistance down to 50 FPM.

2) The flow and pressure drop sensors shall operate over a range of 200 to 2000 feet/min with a total system accuracy of ± 5% of reading. Below this velocity range the unit may be less accurate as long as a repeatable signal is given down to 50 FPM. Installed accuracy shall be percent of reading and demonstrated at both maximum and minimum airflow rates for each measurement location. Coordinate size and location of sensor with AHU manufacturer and mechanical Contractor to design for a velocity at maximum air-flow between 1800 – 2000 FPM to provide a minimum 9 to 1 turn-down. If this can’t be easily accomplished, an alternate, acceptable method is to provide minimum and maximum outdoor air intakes, both with airflow monitors, and to modify the control sequence (and submittal) to indicated the staling of the OA intakes to get the 9-1 turn-down.

3) The electronic module shall be microprocessor-based with a alphanumeric LCD Display. The module shall operate on 24VAC, with an optional 120VAC. The output and input signals shall be field selectable and linear with field adjustable scales and shall include 0-5VDC, 0-10VDC, 4-20mA, BACnet, or LonTalk.
4) Furnish Ebtron GTD116-Pc, Ebtron Air – IQ/GTx-PC (integrated with TAMCO Damper), Air Monitor Voluflo/OAM or approved equal.

b. Supply, Return and Exhaust Air

1) Provide either thermal dispersion velocity meters using biomedical grade self heated glass encapsulated thermistor sensors with thermistor temperature sensors or anodized aluminum pitot airflow traverse probes.

2) The flow stations shall operate over a range of 400 to 4000 feet/min with an accuracy of ±3% of reading. Installed accuracy shall be percent of reading and demonstrated at both maximum and minimum airflow rates for each measurement location.

3) The output signal shall be field selectable and linear with field adjustable scales and shall include 0-5VDC, 0-10VDC, 4-20mA, BACnet, or LonTalk.

4) Furnish Ebtron GTA116-Pc, Air Monitor DPT 2500-plus or approved equal.

8. Carbon Dioxide Sensors

a. Provide wall and duct mounted non-dispersive infrared type carbon dioxide sensors where indicated on drawings. Sensors shall have a field selectable 4 to 20 mA or 0 to 10 VDC linearized output signal over a 0-2000 ppm range (set point will normally be between 600 and 1200 ppm). Power requirement shall be 24 VAC or 24 VDC. Units shall operate in an environment of at least -20°F to 120°F temperature range and 0 to 95% RH. Accuracy shall be +/- 5% of reading or +/- 75 ppm, whichever is greater. Repeatability shall be +/- 20 ppm. Annual drift shall not exceed 75 ppm. Response time shall not exceed 2 minutes. Enclosure shall be an attractive high impact plastic case. Sensors, providing they meet these specifications, shall be as manufactured by R.E. Technologies, Vaisala, Vulcain, Engelhard, Texas Instruments, Enmet Canada Limited, ToxAlert, AirTest, MSA, or approved equal.

9. Carbon Monoxide Sensors (Garage Ventilation)

a. Provide wall mounted solid state or electrochemical type carbon monoxide sensors where indicated on drawings. Sensors shall have UL listed enclosure, a minimum 3 year warranty and 5 year expected life. Sensor shall be mounted 4' to 5' above floor. Sensors shall have a 4 to 20 mA linearized output signal over a maximum 0-250 ppm range (0-100 ppm range is preferred since set points will normally be between 10 and 50 ppm). Power
10. **Hydrogen Gas Detectors (UPS Rooms, Battery Charging Stations)**

   a. Provide wall mounted, solid state, hydrogen detectors where indicated on drawings. Sensors shall have UL listed enclosure, a minimum 3 year warranty and 5 year life expectancy. Sensors shall be mounted one foot below ceiling. Sensors shall have a minimum of 2 relay contacts. Set 1 contact at 10% of lower explosive limit (for exhaust fan control) and set the second contact at 25% of LEL to energize an alarm to the building control system. Units shall operate in an environment of at least 0°F to 104°F temperature range and 0 to 90% RH. Accuracy shall be +/- 10% of reading. Sensors, providing they meet these specifications, shall be as manufactured by BWT/Vulcan, Macurco, or approved equal.

BB. **Control Valves and Actuators**

1. Provide automatic control valves suitable for the specified controlled media (steam, water or glycol). Provide valves that mate and match the material of the connected piping. Equip control valves with the actuators of required input power type and control signal type to accurately position the flow control element and provide sufficient force to achieve no more than the leakage listed in the HVAC valve specification section. Valves shall be pressure independent (PIACV), globe, butterfly (open-closed only), high performance butterfly (open-closed or modulating with Cv at 2/3 open), or characterized ball as listed for the system served and of construction listed in the Division 15 HVAC valve specification for the system’s fluid and temperature/pressure limits and listed herein. Valves shall be manufactured by one of the listed manufacturers (in the HVAC valve specification) or, providing they meet all specified requirements, Belimo, Bray, Delta P Valve, Griswold, Bell & Gossett, Fisher, Honeywell, Johnson, Macon, or Siemens/Staefa.

2. The intent is for PIACVs to be used for all modulating 2-way control valves on all water systems (including glycol). Exceptions would be valves where the PIACV pressure drop is higher than allowed (such as a cooling tower bypass which may have a 3 psi limit). PIACVs shall be used for these systems and where shown on the piping details. Each pressure independent (PI) automatic control valve (ACV) is a two-section valve referred to herein as a PIACV. These valves shall be self balancing (pressure independent) over a minimum operating range across both
sections of the valve assembly of 6 to 45 psid (or up to 58 psid where the associated pump head is over 130 feet) with the mechanical PI section limiting the differential pressure over the ACV section to provide very stable and accurate control. Electronic PI sections are not allowed as they require the ACV section to absorb the entire pressure drop at the maximum psid. Valve flow selection shall be adjustable on the valve assembly. Valves whose flow rate can’t be field selected with at least a 20% range of design flow shall be provided with replacement flow cartridges as required by the balancing Contractor or engineer. The use of up to 3 parallel PIACV’s to achieve the rated flow shall be permitted providing each is installed with a union and the control of the parallel valves is sequential, either by software with a single output or by individual outputs per valve. PIACVs shall have a minimum 2-year unconditional warrantee on parts and labor.

3. Control valves shall meet the heating and cooling loads and flows specified, operate against the normal expected differential pressure without any shortening of life, and close-off against the maximum differential pressure condition for the application (typically pump shut-off head) with a 25% safety factor. Valves should be sized to operate accurately and with stability from 10 to 100% of the maximum design flow. Two-position (open/close) valves shall be full line sized. Unless specified elsewhere, the maximum pressure drop for modulating water/glycol systems control valves shall be 6 psi for PIACVs (including both sections) or 4 psi (minimum pressure drop shall be 1 psi) for non-PIACV control valves (as these will have a separate balancing valve pressure drop). Unless specified elsewhere, the maximum pressure drop for modulating steam control valves shall be 50% of the inlet pressure (7.5 psi for a 15 psig steam system) providing the required equipment inlet pressure is met.

4. Trim material shall be stainless steel for all high differential pressure (over 12 psid) applications.

5. Valve actuators shall be electronic direct coupled over the shaft, enabling it to be mounted directly to the valve shaft without the need for connecting linkage. Actuators shall have electronic overload circuitry to prevent damage. Actuators shall have visual position indicators. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Spring shall be capable of easy field change from normally open to normally closed. Actuators shall have an external manual gear release (above 60 in-lb torque, provide manual crank) to allow manual positioning of the valve when the actuator is not powered. Modulating actuators shall be positive positioning and respond to a 2 to 10 VDC or 4 to 20 mA operating range. Actuators on all valves 3” and larger shall provide a position feedback signal indicating valve position wired to the BAS and indicated on the graphics. Outdoor mounted actuators shall have NEMA 4 enclosure and shall have same voltage heaters to prevent condensation. Indoor actuators near (within 4 feet) of outdoor air streams shall have NEMA 2
enclosures. Actuators shall be sized for the maximum flow and differential pressure available (such as shut-off head of the associated pump) plus a minimum 25% safety factor. Submit sizing calculations with the shop drawings. Actuators shall be as manufactured by Belimo, Bray, Johnson, Siemens, or approved equal.

CC. Control and Smoke Dampers and Actuators

1. Automatic dampers, furnished by the Building Automation Contractor shall be low leakage and include all required linkages, supports, actuators, switches, etc. Dampers are to be installed by the HVAC Contractor under the supervision of the BAS Contractor. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the Sheet Metal Contractor. Control dampers shall be designed for operation in a temperature range of -25°F and 180°F. Smoke dampers shall be UL 555S rated.

2. Damper blade width shall not exceed six inches unless otherwise noted on drawings. Blade and frame seals shall be replaceable extruded silicone, EDPM, or PVC coated polyester (for low velocity dampers only) on blade edges, TPE or stainless steel compression at jambs. Seals and linkages shall provide tight closing, ultra low leakage dampers.

3. Dampers installed on fan discharges shall be oriented such the blades are perpendicular to the fan shaft, this will minimize pressure drop due to uneven airflow from the fan. Unless otherwise noted, provide opposed blade dampers for modulating applications and parallel blade for two-position control. Dampers, providing they meet the requirements of these specifications, shall be as manufactured by Ruskin, Arrow, TAMCO (T. A. Morrison), American Warming and Ventilating (AWV), Vent Products, Greenheck, or Johnson Controls. Note that not all manufacturers may make all types of dampers. Model numbers shown are used to indicate the minimum acceptable quality for each type of damper.

4. Dampers used within 4 feet of outdoor wall louvers, all penthouse/gooseneck intakes or reliefs, and in aluminum duct systems, shall be aluminum. Other dampers used in galvanized steel duct systems shall be either galvanized steel, or aluminum. Dampers for use in stainless steel duct systems shall be either stainless steel or baked herisite coated aluminum (with no steel or galvanized steel parts).

5. Provide insulated aluminum dampers for all unducted outdoor air louvers (such as mechanical and generator room ventilation, space relief’s, etc.) and on the generator exhaust louvers. Insulated dampers shall be equal to Arrow model AFDTI-25LT, Tamco Series 9000BF, Greenheck model ICD-45, AWV model CR58, or Johnson VD-1252 with thermally broken frame and with blades foam insulated and thermally broken to provide a minimum overall R-value of 1.2. Maximum leakage shall not exceed Class 1A (3.0 cfm/sf at 1” w.g. static pressure differential) for all sizes.
6. Low pressure and smoke control dampers (on up to 2" pressure class ductwork) shall be flat blade or airfoil type designed for a minimum of 2.5" differential pressure (all sizes) and up to 2,000 fpm face velocity. These are designated as low pressure dampers. Maximum size of modules for large dampers shall be 4' x 4' (size could be pressure limited) with an AMCA certified leakage rate not exceeding 3.0 (4.0 for smoke dampers) cfm/sf at 1" w.g. static pressure differential for all sizes. Where larger dampers are needed (either dimension), incorporate mullion supports (same material as damper frame) designed to prevent failure or deformation of the damper assembly up to a differential pressure of 4" w.g. Maximum pressure drop of a fully open 2' x 2' damper at 1,500 fpm shall not exceed 0.08".

7. All medium pressure control and smoke dampers (on between 2" and 4" pressure class ductwork) shall be airfoil blade type designed for a minimum of 5" (4" for smoke dampers) differential pressure (all sizes) and up to 4,000 (2,000 for smoke dampers) fpm face velocity. These are designated as medium pressure dampers. Maximum size of modules for large dampers shall be 4' x 4' (size could be pressure limited) with an AMCA (UL 555S for smoke dampers). Control dampers shall have Class 1A certified leakage rate not exceeding 3 cfm/sf at 1" w.g. and 8 cfm/sf at 4" w.g. static pressure differential. Smoke dampers shall have Class 1 certified leakage rate not exceeding 8 cfm/sf at 4" w.g. static pressure differential. Where larger dampers are needed (either dimension), incorporate mullion supports (same material as damper frame) designed to prevent failure or deformation of the damper assembly up to a differential pressure of 6" w.g. Maximum pressure drop of a fully open 4' x 4' damper at 2,500 fpm shall not exceed 0.18".

8. Aluminum Dampers:
   a. Low Pressure Dampers: Frames and single thickness or airfoil blades shall be constructed of not less than 0.080" thick extruded aluminum, type 6063-T5 with minimum 4" deep frame. Linkage hardware shall be installed in frame side and be constructed of aluminum and corrosion resistant, zinc & nickel-plated steel (stainless steel for use in stainless steel duct systems). Coordinate with manufacturers for inclusion of thrust collars and other special requirements where vertical blades are required (such as fan discharges). Aluminum low pressure control dampers shall be equal to Greenheck model VCD-40 or 43 or Ruskin Type CD50. Aluminum low pressure smoke dampers shall be equal to Greenheck model SMD-401M or Ruskin type SD50M.
   b. Medium Pressure Dampers: Frames and airfoil blades shall be constructed of not less than 0.080" thick extruded aluminum, type 6063-T5 with minimum 4" deep frame. Linkage hardware shall be installed in frame side and be constructed of aluminum and corrosion resistant, zinc & nickel-plated steel (stainless steel for use
9. Steel Dampers:
   a. Low Pressure Dampers: Frames shall be a minimum of 5” deep, 1” high, minimum 13 gauge galvanized steel hat channel (stainless steel for use in stainless steel duct systems) or 16 gauge with corner reinforcements to equal 13 gauge strength. Single thickness or airfoil blades shall be a minimum of 16 gauge galvanized steel (stainless steel for use in stainless steel duct systems). Linkage hardware shall be installed in frame side and be constructed of corrosion resistant, zinc & nickel-plated steel (stainless steel for use in stainless steel duct systems). Coordinate with manufacturers for inclusion of thrust collars and other special requirements where vertical blades are required (such as fan discharges). Steel low pressure control dampers shall be equal to Ruskin Type CD60. Steel low pressure smoke dampers shall be equal to Greenheck model SMD-201 or Ruskin type SD37 (2-position) or Greenheck model SMD-301M or Ruskin type SD60M (where modulation is needed per sequences).

   b. Medium Pressure Dampers: Frames shall be a minimum of 5” deep, 1” high, 11 gauge galvanized steel hat channel (stainless steel for use in stainless steel duct systems) or 16 gauge with corner reinforcements to equal 11 gauge strength. Airfoil blades shall be a minimum of 14 gauge equivalent thickness galvanized steel (stainless steel for use in stainless steel duct systems). Linkage hardware shall be installed in frame side and be constructed of corrosion resistant, zinc & nickel-plated steel (stainless steel for use in stainless steel duct systems). Coordinate with manufacturers for inclusion of thrust collars and other special requirements where vertical blades are required (such as fan discharges). Steel medium pressure control dampers shall be equal to Ruskin Type CD60. Steel medium pressure smoke dampers shall be equal to Ruskin Type SD60M.

10. Damper actuators shall be electronic direct coupled over the shaft, enabling it to be mounted directly to the damper shaft with a “V” shaped toothed cradle (to minimize slippage) without the need for connecting linkage. Actuators shall have electronic overload circuitry to prevent damage. Actuators shall have position indicator. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Spring shall be capable of easy field change from normally open to normally closed. Actuators shall have an
external manual gear release (above 60 in-lb torque, provide manual crank) to allow manual positioning of the damper when the actuator is not powered. Modulating actuators shall accept a 0 to 10 VDC or 0 to 20 mA control input and provide a 2 to 10 VDC or 4 to 20 mA operating range. All actuators on dampers larger than 2 square feet shall provide a position feedback signal (such as 2 to 10 VDC) indicating damper position, wired to the BAS and indicated on the graphics.

11. Actuators for dampers mounted in up to 2" pressure class shall be sized for a minimum 2,500 fpm velocity and 2" differential pressure with a minimum 15% safety factor. Actuator for dampers mounted in higher pressure class ductwork shall be sized for 4,000 fpm velocity and a differential pressure equal to the duct design pressure with a minimum 15% safety factor. Show actuator sizing calculations on submittals. Actuators shall be as manufactured by Belimo, Johnson, Siemens, or approved equal. Actuators for smoke dampers shall meet UL 555S requirements.

DD. Contractor Responsibilities

1. General: Installation of the building automation system shall be performed by this Contractor or his Subcontractor(s). However, all installation shall be under the personal supervision of the Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a Subcontractor.

2. Access to Site: Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the Owner or the Owner’s Representative.

3. Code Compliance: All wiring shall be installed in accordance with the more stringent of all applicable electrical codes, equipment manufacturer's recommendations, and wiring specifications in Division 16.

4. Cleanup: At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract. Clean the exposed surfaces of tubing, hangers, and other exposed metal of grease, plaster, or other foreign materials.

EE. Wiring, Conduit and Cable

1. All wire will be copper and meet the minimum wire size and insulation class listed below:

<table>
<thead>
<tr>
<th>Wire Class</th>
<th>Wire Size</th>
<th>Isolation Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>12 Gauge</td>
<td>600 Volt</td>
</tr>
<tr>
<td>Class One</td>
<td>14 Gauge Std.</td>
<td>600 Volt</td>
</tr>
</tbody>
</table>
2. Class Two and Three wiring and communications wiring may be run in the same conduit.

3. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.

4. Where wiring is required to be installed in conduit, galvanized EMT shall be used indoors unless indicated otherwise on the Drawings or as required by Division 16 specifications. Conduit shall be minimum 1/2 inch. Set screw fittings are acceptable for dry interior locations. EMT with compression fittings shall be used for interior damp locations. All exterior conduit shall be GRSC with threaded fittings. Provide conduit seal-off fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.

5. Flexible metallic conduit (max. 3 feet) shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.

6. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasketed covers.

7. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated. Teflon wiring can be run without conduit above suspended ceilings. EXCEPTION: Any wire run in suspended ceilings that is used to control outside air dampers or to connect the system to the fire management or smoke control systems shall be in conduit.

8. Coaxial cable shall conform to RG62 or RG59 rating. Provide plenum rated coaxial cable when running in return air plenums.

9. Ethernet 10/100 Base –T network wiring shall be equivalent to Owner's premise wiring or, as a minimum, Category 5e or 6 cabling up to 300' maximum run.

10. Fiber optic cable shall be used for runs over 300' and shall include the following sizes; 50/125, 62.5/125 or 100/140.

11. Only glass fiber is acceptable, no plastic.
12. Fiber optic cable shall only be installed and terminated by an experienced Contractor. The BAS Contractor shall submit to the Engineer the name of the intended Contractor of the fiber optic cable with his submittal documents.

FF. Hardware Installation

1. Installation Practices for Wiring
   a. All controllers are to be mounted vertically and per the manufacturer’s installation documentation.
   b. The 120VAC power wiring to each Ethernet or Webserver controller shall be a dedicated run, with a separate breaker. Each run shall include a separate hot, neutral and ground wire. The ground wire shall terminate at the breaker panel ground. This circuit shall not feed any other circuit or device.
   c. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.
   d. Wires shall be attached to the building proper at regular intervals such that wiring does not droop. Wires shall not be affixed to or supported by pipes, conduit, ducts, etc.
   e. Conduit in finished areas, shall be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.
   f. Conduit, in non-finished areas where possible, shall be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. Exposed conduit will run parallel to or at right angles to the building structure.
   g. Wires shall be kept a minimum of three (3) inches from all piping.
   h. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.
   i. Wire shall not be allowed to run across telephone equipment areas.

2. Installation Practices for Field Devices
   a. Well-mounted sensors shall include thermal conducting compound within the well to insure good heat transfer to the sensor.
b. Actuators shall be firmly mounted to give positive movement and linkage shall be adjusted to give smooth continuous movement throughout 100 percent of the stroke.

c. Relay outputs shall include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.

d. Water line mounted sensors shall be removable without shutting down the system in which they are installed.

e. For duct static pressure sensors, the high pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low pressure port shall be left open to the plenum area at the point that the high pressure port is tapped into the ductwork.

f. For building static pressure sensors, the high pressure port shall be inserted into the space via a metal tube. Pipe the low pressure port to the outside of the building with a shield to prevent distortion of reading due to wind.

3. Enclosures

a. For all I/O requiring field interface devices, these devices where practical shall be mounted in field interface panels (FIP). The Contractor shall provide an enclosure, which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.

b. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.

c. FIP enclosures shall be of steel construction with baked enamel finish, NEMA 1 rated with hinged doors and keyed locks. The enclosures shall be sized for twenty percent spare mounting space. All locks will be keyed identically.

d. All wiring to and from the FIP shall be to labeled screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.

e. All outside mounted enclosures shall meet the NEMA-4 rating.

f. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

4. Identification
a. Identify all control wires with labeling tape or sleeves using words, letters, and/or numbers that can be exactly cross-referenced with as-built drawings.

b. All I/O field devices inside field interface panels (FIP) shall be clearly labeled.

c. Junction box covers shall be marked to indicate that they are a part of the BAS system.

d. All enclosures (including controllers), all I/O field devices (except space sensors), all control valves and actuators, all routers and other field devices that are not mounted within FIP's shall be identified as follows:

   1) Identification shall be with bakelite nameplates. The lettering shall be in white against a black or blue background, be keyed to the as built drawings, and indicate that the device is a control device.

5. Location

a. The location of sensors shall be per mechanical and architectural drawings. Coordinate with installing Contractor to provide appropriate straight upstream and/or downstream runs for accurate readings of mixed temperatures or flows.

b. Space humidity, carbon dioxide or temperature sensors shall be mounted away from machinery generating heat, direct light and diffuser air streams.

c. Outdoor air temperature sensors shall be mounted on the north building face directly in the outside air. Install outdoor temperature and humidity sensors with solar radiation/precipitation shields to minimize the effects of heat radiated from the building or sunlight and from rain.

d. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

e. Control panels used for smoke control shall be located in building life safety electric rooms, coordinate exact locations with the electrical Contractor.

GG. Software Installation

1. General

   a. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section.
This includes any operating system software or other third party software necessary for successful operation of the system.

b. The Contractor shall cooperate with the balancing Contractor and set-up Global Override Commands as required to expedite balancing of air handling and pumping systems. Overrides (to open VAV boxes to desired flow or to open valves) shall be set-up for each system by floor and/or wing so that the total amount of flow can easily be set to equal the desired flow of the central equipment.

2. Database Configuration: The Contractor shall provide all labor to configure those portions of the database that are required by all systems and their respective sequence of operation.

3. Color Graphics: Unless otherwise directed by the Owner, the Contractor shall provide color graphic displays for each system and floor plan. Due to limitations on monitor size, some systems may need to be divided into multiple graphics. Provide hot links to all associated graphics for easy switching. For each system or floor plan, the display shall contain the associated points identified in the sequence and submitted point list and allow for set point changes. Color shall be used to highlight conditions that are out of range or in alarm.

4. Reports: The Contractor shall configure a report for each system as well as overall energy usage and demand reports. As built software documentation shall include the following as a minimum:
   a. Descriptive point lists.
   b. Application program listing.
   c. Application programs with comments.
   d. Printouts of all reports.
   e. Alarm list.
   f. Printouts of all graphics.

HH. System Startup and Acceptance Testing

1. Cooperate and coordinate with all trade Contractors in the start-up of all BAS controlled and monitored equipment, as well as during the testing, balancing, and acceptance of the systems. Work with the balancing Contractor to verify readings from the BAS agree with field measurements (such as VAV box flows) and that final set points for items such as differential pressure sensors (for VFD control) are not too high or too low for all downstream components to reach design flow.
2. **Point to Point Checkout:** Each I/O device (both field mounted and located in field interface panels and firefighters override panels (FOP)) shall be inspected and verified for proper installation and functionality (such as fan status and valve positioning). A pre-functional performance test checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager and submitted (with copy to the Owner’s Representative).

3. **Controller and Webserver Checkout:** A field checkout of all controllers and the Webserver, modem, etc. shall be conducted to verify proper operation of both hardware and software. A pre-functional performance test checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted (with copy to the Owner’s Representative) before the completion of the project.

4. **System Acceptance Testing**
   a. All application software shall be verified and compared against the specified sequences of operation in both normal and failure modes. Control loops shall be exercised by inducing a set point shift of at least 10% and observing whether the system successfully returns the process variable to set point. Record all test results and attach to the Functional Performance Test Results Sheets and submit (with copy to Owner’s Representative).
   b. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations [existing operator’s workstation, Webserver, Webserver users, or printers, and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit Functional Performance Test Results Sheets (with copy to the Owner’s Representative).
   c. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, that the control systems readings (flows, temperatures, etc.) match field readings, and that any special features work as intended. Submit Functional Performance Test Results Sheets (with copy to the Owner’s Representative).
   d. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information. Submit Functional Performance Test Results Sheets (with copy to the Owner’s Representative).
e. Perform an operational test of the Webserver by testing all graphics and systems (including alarm acknowledgement) from remote locations. Submit Functional Performance Test Results Sheets (with copy to the Owner’s Representative).

f. After the above tests have been completed and the system has demonstrated to function as specified, a 30-day performance test period shall begin. If all systems perform as specified throughout the test period, requiring only routine maintenance, submit Functional Performance Test Results Sheets for each system (with copy to the Owner’s Representative) and the BAS system shall be accepted. If any system fails during the test, and cannot be fully corrected within 8-hours, the Owner may request that the performance test be repeated and delay acceptance until all systems pass.

II. Sequences of Operation: Sequences of operation shall be as shown on drawings. If any items are not shown, include BAS manufacturer’s best standard sequences.

JJ. Final Documentation: Upon completion of work and prior to request for Certificate of Occupancy, Contractor shall issue a certificate stating that work has been installed generally consistent with construction documents and tested per the specifications. All submittals, test reports, as-builts and O&M manuals are to be provided for engineer’s review, prior to request for engineer’s completion certificates. In addition, and also prior to request for completion certificates, all punch list items must be completed to the satisfaction of the engineer. The Contractor must verify that all sequences of operations and controls have been incorporated and all systems and equipment are working per the sequences of operations. A blank Contractor’s certificate form can be furnished by RDK Engineers upon request.

PART 3 - EXECUTION

3.0 DEMOLITION

A. The existing facility will continue to operate during all phases of the demolition work and subsequent construction. No interruption of the systems will be permitted without prior approval of the Owner’s Representative.

B. Submit proposed methods and sequence of operations for the selective demolition work to the Owner’s Representative for review prior to the start of the work.
C. Perform all demolition while ensuring minimum interference with adjacent occupied areas.

D. Where sections of a system are to be removed and the system serves other areas of the building that are outside the scope of the work, perform the following:
1. Coordinate the temporary shutdown of the system with the Owner's representative.
2. Install supports in the remaining active sections of the system as required by the removal of nearby supports associated with the demolition.
3. Isolate the system.
4. Cap the remaining system section, leaving the remainder of the system active.

E. Provide temporary shoring or bracing during the demolition work to prevent movement, settlement, or collapse of the system or adjacent systems due to the work.

F. Promptly repair any damage caused to adjacent facilities or areas that are designated to remain at no additional cost to the Owner.

G. Equipment:
1. Coordinate with the Contractor and Subcontractors to provide disconnection prior to equipment removal.
2. Remove equipment by unfastening at the supports or attachments. Then remove the attachments from the building, leaving no component of the original installation.
3. The Owner shall choose to take possession of the equipment or not. If the Owner chooses not to take possession of the equipment, the Subcontractor shall remove the equipment and dispose of the equipment in accordance with Paragraph H specified below.
4. Exercise care with equipment that is to be relocated or turned over to the Owner, examine the equipment before removal in the presence of the Owner's representative to determine its condition. Make a record of any marks, etc. by a photograph or videotape acknowledged by the Owner's representative.
5. Install relocated equipment to ensure no damage.
6. Equipment to be turned over to the Owner: Deliver to an on-site location designated by the Owner, and obtain acknowledgment of receipt in good condition.

H. All equipment, etc., not turned over to the Owner shall be put into the General Contractor's dumpsters; become the property of the General Contractor, and shall be removed from the site by the General Contractor. For equipment
containing any refrigerant, it shall be reclaimed for recycling. Any hazardous materials such as mercury from thermometers or thermostats; ethylene glycol; or lead shall be properly disposed of, following EPA guidelines.

3.1 GENERAL

A. Install all items specified under PART 2 - PRODUCTS, according to the manufacturer's requirements and best quality recommendations, shop drawings, the details as shown on the Drawings and as specified in this specification section.

B. Earthwork: Excavation and backfilling for underground piping and tanks shall be as specified in the EXCAVATION, TRENCHING AND BACKFILLING section.

C. Install all work so that parts requiring inspection, replacements, maintenance and repair shall be readily accessible. Minor deviations from the Drawings may be made to accomplish this, but any substantial change shall not be made without prior written approval from the Owner.

D. Equipment bases mounted on concrete slabs and pads, or mounted on stands, gratings, platforms, or other, shall not be set in any manner, except on the finished and permanent support.

E. Support of equipment on studs or other means, and the placing or building of the supporting slab, pad, pier, stand, grating, or other "to the equipment", is prohibited.

F. Concrete supporting structures shall have been constructed and cured a minimum of 14 days before equipment is mounted.

G. All welding done under this section shall be performed by experienced welders in a neat and workmanlike manner. All welding done on piping, pressure vessels and structural steel under this Section shall be performed only by persons who are currently qualified in accordance with ANSI Code B31.9 and B31.1 for Pressure Piping and certified by the AWS, ASME or an approved independent testing laboratory, and each such welder shall present certificate attesting his/her qualifications to the Architect's representative whenever requested to do so on the job.

H. All pipe welding shall be oxyacetylene or electric arc. High test welding rods suitable for the material to be welded shall be used throughout. All special fittings shall be carefully laid out and joints shall accurately match intersections. Care shall be exercised to prevent the occurrence of protruded weld metal into the pipe. All welds shall be of sound metal free from laps, cold shots, gas pockets, oxide inclusions and similar defects.
I. All necessary precautions shall be taken to prevent fire or damage occurring as the result of welding operations.

J. Care shall be taken when working on the roof. Protect the roof from damage.

3.2 IDENTIFICATION

A. General

1. All piping, ductwork, equipment, panels, and valves furnished and/or installed under this Section of the Specifications shall be marked for ease of identification.

2. Marking shall be done using self-adhering (screw or rivets for equipment) labels applied to clean, smooth surfaces. All lettering shall have sharply contrasting background for ease of identification. Colors shall be in accordance with ANSI A13.1 Standards. Samples of stickers together with color schedules shall be submitted for approval.

B. Ductwork and Fire and Smoke Dampers

1. Ductwork marking labels shall be prominently mounted on all ductwork. Locate labels near points where ducts enter into and exit from concealed spaces and maximum intervals of 40 feet along each run. Reduce intervals to 20 feet in areas of congested ducts and above ceilings. In finished occupied spaces without ceilings (exposed ducts) labels shall be located just before the duct enters the space and just after the duct exits the space and at intervals of 100' within the space. For ductwork in shafts, marking shall be at each floor.

2. Ductwork markers shall indicate the direction of airflow with ductwork designation (supply, exhaust, return) and which system (i.e. VAV-1, AHU-1, EF-1, etc.) it is connected to.

3. Provide permanently mounted labels on the access doors for all duct mounted Fire, Smoke and Combination Fire/Smoke Dampers. Labels shall have minimum $\frac{1}{2}$ inch high lettering as follows for the type of damper installed: FIRE DAMPER, SMOKE DAMPER, FIRE/SMOKE DAMPER.

C. Pipe Identification

1. Provide color-coded pipe identification markers prominently located on all piping in the building installed under this Section. Pipe markers shall be heavy plastic faced cloth labels with heat resistant backing, “Set Mark” by Seton Nameplate Corporation, Zipper Tubing Co., or equal by the W. H. Brady Company or approved equal.

2. Provide each pipe with markers/labels indicating the service, size (in inches), and arrow markers to indicate the direction(s) of flow.
3. Pipe labels shall be spaced at maximum intervals of 40 feet along each run. Reduce intervals to 20 feet in areas of congested piping and equipment and above ceilings. In finished occupied spaces without ceilings (exposed piping) labels shall be located just before the piping enters the space and just after the piping exits the space and at intervals of 100' within the space. Provide labels near each valve and control device. This work shall be done after finish painting has been completed.

4. The following color coding shall be used with names in black letters on backgrounds indicated:

<table>
<thead>
<tr>
<th>Service</th>
<th>Legend</th>
<th>Background Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot water supply</td>
<td>HWS</td>
<td>Yellow</td>
</tr>
<tr>
<td>Hot water return</td>
<td>HWR</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

5. In general, a 2" high legend shall be used for pipe lines 4" diameter and larger, and a 3/4" high legend shall be used for pipe lines 3" diameter and smaller.

6. All markers shall be OSHA approved.

D. Equipment Identification (by Unit Manufacturer)

1. Equipment marking shall be prominently located and securely attached with screws or rivets (no adhesives or cements are permitted) on the normally visible side of the equipment.

2. Equipment identification designations shall be taken from equipment callouts as shown on drawings and coordinated with the Owner’s facility group to assure designations match up with Owner’s maintenance management system identification database.

3. Provide on the label (or on a prominently located second label) all required routine maintenance action (per manufacturer). Label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product.

E. Valve Tags

1. All valves on pipes of every description shall have numbering tags. The valve numbers shall correspond with numbers indicated for valves and controls on two-printed Valve Lists prepared using electronic database by the HVAC Subcontractor. These printed lists shall state the numbers and locations of each valve and control and the section, fixture or equipment which it controls, and other necessary information, such as requiring the opening or closing of another valve when one valve is to be opened or closed.

2. Provide flow diagrams showing all valves. Use the Valve List for callouts of all valves on the flow diagrams, prepared in a form to meet the approval...
of the Architect. Include this info in the operating and maintenance (O&M) manuals, and, for all mechanical rooms, provide the information laminated, mounted and framed under glass at the direction of the Owner. All valve interior diameters shall be shown in the O&M manuals and on the final Record Drawings.

3. Valve tags shall have neat circular black and white laminated fibre-engraved white showing through tags of at least 1 ½" in diameter, attached with a brass hook to each valve stem. Stamp on these valves tags in letters, as large as practical, the number of the valve and the service such as indicated on the “Valve List”. The numbers on each service shall be consecutive. All valves on tanks and pumps shall be numbered by 3” black and white laminated fibre-engraved white showing through discs with white numbers 2” secured to stem of valves by means of brass hooks or small solid link brass chain.

3.3 PIPING

A. General

1. Piping shall be cut accurately to measurements established at the jobsite, shall be installed without cold springing, and shall properly clear windows, doors and other openings and electrical gear. Cutting or other weakening of the building structure to facilitate piping installation will not be permitted. Piping shall be free of burrs, oil, grease, and other foreign matter. Piping shall be installed to permit free expansion and contraction without damaging building structure, pipe, joints, or hangers. Changes in direction shall be made with fittings. Vent pipes shall be carried through the roof and shall be properly flashed.

2. Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. A waterproofing clamping flange shall be installed as indicated. Sleeves shall not be installed in structural members except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its specified wall, floor, or roof, and shall be cut flush with each surface, except that sleeves through floors and roofs shall extend above the top surface at least 6 inches for proper flashing or finishing. Membrane clamping rings shall be provided where membranes are penetrated. Unless otherwise indicated or required by the sealing system, sleeves shall be sized to provide a minimum clearance of 1/4 inch between bare pipe and sleeves or between jacket over insulation and sleeves. Sleeves in bearing walls, waterproofing membrane floors, and wet areas shall be galvanized steel pipe. Sleeves in nonbearing walls, floors, or ceilings may be galvanized steel pipe or galvanized sheet metal with lock-type longitudinal seam. Except in pipe chases or interior walls, the annular space between pipe and sleeve or between jacket over insulation and sleeve in non-fire rated walls, partitions, and floors shall be sealed as indicated and specified.
Metal jackets shall be provided over insulation passing through exterior walls, fire walls, fire partitions, floors, or roofs, shall not be thinner than 0.006 inch thick aluminum, if corrugated, and 0.16 inch thick aluminum, if smooth, and shall be secured with aluminum or stainless steel bands not less than 3/8 inch wide and not more than 8 inches apart. When penetrating roofs, before fitting the metal jacket into place, a 1/2-inch wide strip of sealant shall be run vertically along the inside of the longitudinal joint of the metal jacket from a point below the backup material to a minimum height of 36 inches above the roof.

3. If the pipe turns from vertical to horizontal, the sealant strip shall be run to a point just beyond the first elbow. When penetrating waterproofing membrane for floors, the metal jacket shall extend from a point below the backup material to a minimum distance of 2 inches above the flashing. For other areas, the metal jacket shall extend from a point below the backup material to a point 12 inches above floor; or when passing through walls above grade, jacket shall extend at least 4 inches beyond each side of the wall.

4. Pipes Passing through Waterproofing Membranes: In addition to the pipe sleeves referred to above, pipes passing through roof or floor waterproofing membranes shall be provided with a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall set over the roof or floor membrane in a troweled coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches above the roof or floor. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Pipes passing through roof or floor waterproofing membrane shall be installed through a galvanized steel sleeve. The annular space between pipe and sleeve or conduit and sleeve shall be sealed by a modular mechanical-type sealing assembly (equal to Link-Seal). The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe/conduit and sleeve with corrosion protected carbon steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide a water-tight seal between the pipe/conduit and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe/conduit and sleeve involved. The Contractor shall provide sleeves of the proper diameters and gauge.

B. Water Piping:

1. Unless otherwise indicated, horizontal water piping shall pitch down in the direction of flow with a grade of not less than 1 inch in 40 feet and condensate drain piping shall pitch down in direction of flow with a grade
of not less than 1 inch in 10 feet. Open ends of pipelines and equipment shall be properly capped or plugged during installation to keep dirt or other foreign materials out of the systems. Pipe not otherwise specified shall be uncoated.

2. Unless otherwise allowed in Part 2 Piping and Fittings, or shown on the drawings, connections to equipment shall be made with malleable-iron unions or flanges for steel pipe 2 inches or less in diameter and with flanges or grooved joint couplings for pipe 2-1/2 inches or more in diameter. Unions for copper pipe or tubing shall be brass or bronze. Connections between ferrous piping and copper piping shall be electrically isolated from each other with dielectric waterway as specified in the Part 2 Piping and Fittings section of this specification. Where the temperature or pressure of the system is beyond the waterway limits, dielectric couplings or other approved methods shall be used. Reducing fittings shall be used for changes in pipe sizes.

3. Pipe joints between sections of pipe shall be as listed in the Part 2 Piping and Fittings section in the Schedules for Piping and Fittings tables. Exceptions are pipe and fittings installed in inaccessible conduits or trenches beneath concrete floor slabs or in difficult to access locations such as shafts which shall be welded, soldered or brazed. Some joint types or materials listed may have lower pressure and/or temperature limits and Contractor shall ensure they are only used where those limits will NOT be exceeded.

4. Welded joints shall be fusion welded in accordance with ASME B31.1 for all water piping over 160 psig and any other piping where B31.1 is required. All other piping shall be welded in accordance with ASME B31.9 unless otherwise stated. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be acceptable. Branch connections may be made with either welding tees or forged branch outlet fittings, either being acceptable without size limitation. Branch outlet fittings, where used, shall be forged, flared for improvement flow where attached to the run, reinforced against external strains, and designed to withstand full pipe bursting strength.

   a. Beveling: Field and shop bevels shall be in accordance with the recognized standards and shall be done by mechanical means or flame cutting. Where beveling is done by flame cutting, surfaces shall be cleaned of scale and oxidation before welding.

   b. Alignment: Before welding, the component parts to be welded shall be aligned so that no strain is placed on the weld when finally positioned. Height shall be so aligned that no part of the pipe wall is offset by more than 20 percent of the wall thickness. Flanges and branches shall be set true. This alignment shall be preserved during the welding operation. If tack welds are used, welds shall be of the same quality and made by the same
procedure as the completed weld; otherwise, tack welds shall be removed during the final welding operation.

c. Erection: Where the temperature of the component parts being welded reaches 32 degrees F or lower, the material shall be heated to within 100 degrees F of the system’s maximum design temperature for a distance of 3 feet on each side of the weld before welding, and the weld shall be finished before the materials cool to within 200 degrees F of the maximum design temperature.

d. Defective Welding: Defective welds shall be removed and replaced. Repairing of defective welds shall be in accordance with the applicable standard: ASME B31.9 or B31.1.

e. Electrodes: After filler metal has been removed from its original package it shall be protected or stored so that its characteristics or welding properties are not affected. Electrode material shall be as required for the pipe material. Electrodes that have been wetted or that have lost any of their coating shall not be used.

5. Flanges and unions shall be faced true, and made square and tight. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thickness, full-face or self-centering flat ring type. The Gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). NBR binder shall be used for hydrocarbon service. Union or flange joints shall be provided in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as coils, pumps, control valves, and other similar items.

6. Threaded joints shall be made with tapered threads properly cut and shall be made perfectly tight with Teflon (polytetrafluoroethylene) tape or equal. Teflon tape shall be non-toxic and rated for piping systems with temperatures to at least 450 degree F and pressures to at least 1,000 psig. Tape shall be applied the male threads only, and in no case to the fittings.

7. Malleable iron pipe press fittings equal to IMS Fastlock may be used (where allowed in the Part 2 Piping and Fittings section of these specifications) and shall be installed in accordance with the manufacturer's guidelines and recommendations. Pipe shall be certified for use with the IMS Fastlock system. Pipe shall be square cut, properly deburred, and cleaned. Pipe ends shall be marked at the required location to ensure full insertion into the coupling or fitting during assembly. Use an IMS Fastlock approved tool with the proper sized jaw for pressing. Prior to putting the system into operation, Contractor shall perform an air pressure test to provide quick and easy identification of connections which have not been pressed.

8. Grooved joint piping systems may be used (where allowed in the Part 2 Piping and Fittings section of these specifications) and shall be installed in
accordance with the manufacturer's guidelines and recommendations. All grooved couplings, fittings, valves and specialties shall be supplied by a single manufacturer. The gasket style and elastomeric material (grade) verified as suitable for the intended service as specified. Gaskets shall be supplied by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove. Provide all additional hangers required by the system (at least one hanger per flex coupling) where expansion joints are used. A factory trained field representative (a direct employee) shall provide on-site training to Contractor's field personnel in the installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

9. **Soldered and Brazed Joints**: Pipe and tubing shall be cut square and burrs shall be removed. Both inside of fittings and outside of tubing shall be cleaned with an abrasive before sweating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connection. Changes in direction of piping shall be made with soldered or brazed fittings only. Solder and flux shall be lead free. Joints for soldered fittings shall be made with silver solder or 95:5 tin-antimony solder, or as specified in the Part 2 Piping specification for the system. Cored solder shall not be used. Joints for brazed fittings shall use brazing alloys with strength equal to B-Ag alloy and have a melting point above 1000 degrees F. Swing joints or offsets shall be provided on all branch connections, mains, and risers to provide for expansion and contraction forces without undue stress to the fittings or to short lengths of pipe or tubing. Care shall be taken to ensure solder is uniformly (360 degrees) drawn into the joint.

10. **Viega ProPress press fittings may be used where allowed in the Part 2 Piping and Fittings section of these specifications. Prepare copper tube and install in strict accordance with manufacturer’s installation instructions. Pipe ends shall be cleaned, free from indentations, projections, burrs and foreign matter. Use a tube preparation tool as supplied by manufacturer to clean and make installation mark. Push copper tube into fittings to installation depth mark, per manufacturer’s installation instructions. Keep fittings free of dirt and oil. Prior to putting the system into operation, Contractor shall verify all connections have been properly pressed.**

11. **Vic Press 304™ or ProPress stainless steel crimped joints may be used where allowed in the Part 2 Piping and Fittings section of these specifications. Install in strict accordance with manufacturer’s installation instructions. Pipe shall be certified for use with the system manufacturer. Pipe shall be square cut, properly deburred, and cleaned. Pipe ends shall be marked at the required location, using a manufacturer-supplied gauge, to ensure full insertion into the coupling or fitting during assembly. Use a system manufacturer’s recommended tool with the proper sized**
jaw for pressing. Prior to putting the system into operation, Contractor shall verify all connections have been properly pressed.

3.4 FIRESTOPPING INSTALLATION

A. Install firestopping assembly at locations shown and as specified in accordance with UL FRD systems or FM P7825 designs, and as recommended by manufacturer. Do not cover or enclose firestopped areas until approved by the Owner’s Representative.

B. Completely fill openings around penetrating items with firestopping material to prevent spread of fire in the following locations:
   1. Around duct, cable, conduit, piping, and their supports that penetrate fire-rated above grade floor slabs, interior partitions, and exterior walls.
   2. Around openings and penetrations through fire-rated ceiling assemblies.
   3. Around penetration of vertical fire-rated service shafts.
   4. Around openings and penetrations through fire-rated enclosures.
   5. Other locations indicated.
   6. At all air barrier penetrations as defined in the State’s Energy Code.

C. Completely fill voids flush with the surface; the depth of material shall be in accordance with UL FRD or FM P7825. Firestopping for filling voids in floors in which smallest dimension of a void is 4 inches or more shall support the floor design load or be protected by a permanent barrier. Damaged, disrupted, or removed firestoppings shall be replaced with new firestoppings as specified in this section.

D. Insulated Pipes and Ducts: Cut and remove thermal insulation where pipes or ducts pass through firestoppings. Replace thermal insulation with a material having equal thermal insulating characteristics and equal firestopping characteristics.

E. Wall and Floor Penetration by Plastic Drain, Waste, and Vent Pipes: A 2 hour fire resistive chase enclosure shall be maintained by encasing the pipe in an 18 inch steel sleeve and penetrating the chase at a 45 degree downward angle. Chases shall be firestopped at each floor.

3.5 CONNECTIONS TO EQUIPMENT

A. Supply and return connections shall be provided by the Contractor unless otherwise indicated. Valves and traps shall be installed in accordance with the manufacturer’s recommendations. Unless otherwise indicated, the size of the supply and return pipes to each piece of equipment shall be not smaller than the
connections on the equipment. No bushed connections shall be permitted. Change in sizes shall be made with reducers or increasers only.

3.6 BRANCH CONNECTIONS

A. Branches shall pitch up or down as indicated, unless otherwise specified. Connection shall be made to insure unrestricted circulation, eliminate air pockets, and permit drainage of the system.

3.7 SUPPORTS

A. Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. All piping subjected to vertical movement when operating temperatures exceed ambient temperatures, shall be supported by variable spring hangers and supports or by constant support hangers.

B. Piping and attached valves shall be supported and braced to resist seismic loads as specified under the SEISMIC PROTECTION FOR MECHANICAL, ELECTRICAL EQUIPMENT section. Structural steel required for reinforcement to properly support piping, headers, and equipment, but not shown, shall be provided under this section. Material used for supports shall be as specified under the STRUCTURAL STEEL section.

1. Structural steel brackets required to support piping, headers, and equipment, but not shown, shall be provided under this section. Material and installation shall be as specified under the STRUCTURAL STEEL section. Pipe hanger loads suspended from steel joist panel points shall not exceed 50 pounds. Loads exceeding 50 pounds shall be suspended from panel points.

2. Multiple pipe runs on a common base member shall be supported by clamps where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for any individual pipe in the multiple pipe run.

C. Pipe hangers, inserts and supports shall conform to MSS SP-58 and MSS SP-69, except as specified as follows:

1. Types 5, 12, and 26 shall not be used.

2. Type 3 shall not be used on insulated pipe which has a vapor barrier. Type 3 may be used on insulated pipe that does not have a vapor barrier if clamped directly to the pipe and if the clamp bottom does not extend through the insulation and the top clamp attachment does not contact the insulation during pipe movement.
3. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for Type 18 inserts.

4. Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and have both locknuts and retaining devices, furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

5. Type 20 attachments used on angles and channels shall be furnished with an added malleable iron heel plate or adapter.

6. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

7. Where Type 39 saddle or Type 40 shield are permitted for a particular pipe attachment application, the Type 39 saddle shall be used on all pipe 4 inches and larger.

8. Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves.

9. Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of not more than 15 feet, except that pipe shall be supported not more than 8 feet from end of risers, and at vent terminations.

10. Type 35 guides using steel, reinforced PTFE or graphite slides shall be provided where required to allow longitudinal pipe movement. Lateral restraints shall be provided as required. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions and bearing loads encountered. Where steel slides do not require provision for restraint or lateral movement, an alternate guide method may be used. On piping 4 inches and larger, a Type 39 saddle may be welded to the pipe and freely rest on a steel plate. On piping under 4 inches, a Type 40 protection shield may be attached to the pipe or insulation and freely rest on a steel slide plate. Where there are high system temperatures and welding to piping is not desirable, then the Type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches, or by an amount adequate for the insulation, whichever is greater.

11. Except for Type 3, pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation.

D. Piping in trenches shall be supported as indicated on drawings and as required by the manufacturer.

E. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or covered, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe sleeves or to
extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used. Escutcheons shall be chromium-plated iron or chromium-plated brass, either one-piece or split pattern, held in place by internal spring tension or setscrew.

3.8 STRAINERS

A. Provide a full size strainer on the inlet side of each modulating automatic control valve over 1”, pump, and elsewhere as shown on the Drawings and details. Full pipe size (non-reducing) suction diffusers may be substituted for pump suction strainers.

B. Each strainer shall be provided with a full size blow down valve located 6-12” below the strainer. Blow down connection shall be as the low point of the strainer.

C. Strainer shall have stainless steel screens with maximum 1/8” perforations (for pumps). Minimum perforations shall be 3/32”.

3.9 GAUGES AND THERMOMETERS

A. Pressure Gauges

1. Provide at the following locations:
   a. At the discharge connection of each pump as well as the inlet and outlet of each pump suction diffuser or strainer.
   b. At inlet and outlet of each chilled and hot water heating coil (except fan coils, reheat coils, and unit type heaters).
   c. At inlet and outlet of each heat exchanger.
   d. In addition to the above, as indicated on diagrams.

2. All gages shall be provided with isolation valves. Snubbers shall be provided on all pressure gauge connections.

3. Gauges on piping in the Mechanical Room shall be so placed as to be easily read from the floor without parallax.

B. Thermometers, Wells, and Pressure/Temperature Plugs

1. Provide, where shown on the Drawings and where specified herein. Thermometers located over 7 feet above floor shall be remote bulb type.

2. All thermometer wells shall be installed in such a manner that a minimum of restrictions will be caused to the flow in the pipes and so the thermometers can be easily read from the floor. For piping under 3”, wells shall be installed at a 45° angle in the piping.

3. Pressure/temperature plugs (P/T plugs) shall be installed at:
a. Inlet and outlet of each strainer (that does have a pressure gauge), control valve (that doesn’t have either a pressure gauge or integral P/T plus), duct mounted coil, unit heater, cabinet unit heater, fan coil unit, and unit ventilator.

b. Elsewhere as indicated on drawings.

4. Thermometers shall be permanently installed at:
   a. Water inlet and outlet of each chiller, heat exchanger, and air handling unit water coils.
   b. Elsewhere as indicated on Drawings.

5. Additional thermometer wells shall be installed at each point of temperature sensing and control (coordinate with ATC contractor and control drawings).

3.10 ANCHORS AND GUIDES

A. Anchors and guides shall be provided where necessary or indicated to localize expansion or prevent undue strain on piping. Anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Anchor braces shall be installed using turnbuckles where required. Supports, anchors, guides, or stays shall not be attached in places where construction will be damaged by installation operations or by the weight or expansion of the pipeline.

3.11 PIPE EXPANSION

A. The expansion of supply and return pipes shall be provided for by changes in the direction of the run of pipe, by expansion loops, or by expansion joints as indicated or as required.

1. Expansion Loops shall provide adequate expansion of the main straight runs of the system within the stress limits specified in ASME B31.1. The loops shall be cold-sprung only where indicated or required. Pipe guides shall be provided as indicated and as required.
   a. Expansion loops in grooved piping systems shall utilize flexible couplings. Rigid couplings shall not be used. Hanging guidelines shall conform to either manufacturer’s published suggested spacing guidelines; or the requirements of the pipe hanger of this specification; whichever is more stringent.

2. Joints of the type specified shall be used for low temperature water systems and shall be installed where indicated. The joints shall provide for either single or double expansion of the connected pipes as indicated and for the traverse indicated. The joints shall be designed for a working temperature and pressure suitable for the application and in no case less
than 125 psig. The joints shall be in accordance with applicable requirements of EJMA-01 and ASME B31.1. End connections shall be flanged or grooved. Anchor bases or support bases shall be provided as indicated or required. Initial setting shall be made in accordance with the manufacturer's recommendations to allow for ambient temperature at time of installation. Pipe alignment guides shall be installed as recommended by the joint manufacturer, but in any case shall be not more than 5 feet from expansion joint, except in lines 4 inches or smaller where guides shall be installed not more than 2 feet from the joint.

3.12 VALVES AND EQUIPMENT ACCESSORIES

A. Valves shall be of the type and construction specified for the service and installed at the locations shown or specified, and where required for the proper functioning of the system as directed. Valves shall be installed with their stems horizontal to or above the main body of the valve. Valves used with ferrous piping shall have threaded or flanged ends and threaded or sweat-type connections for copper tubing. Non-flanged valves shall have unions for ease of maintenance.

B. Gravity flow-control (check) valves to control the flow of water shall be installed where specified or indicated on the drawings. The valve shall operate to prevent reverse flow and so that when the circulating pump starts, the increased pressure within the main will open the valve; when the pump stops, the valve will close. The valve shall be constructed with a cast iron body and shall be provided with a device whereby the valve can be opened manually to allow gravity circulation. The flow-control valve shall be designed for the intended purpose, and shall be installed as recommended by the manufacturer.

C. Relief valves shall be installed where specified or indicated on drawings. Every closed loop piping system shall have system relief valve(s). For glycol systems, discharge shall be piped for gravity flow into a funnel to the glycol fill tank.

D. A thermometer well (or Pete’s plug) shall be provided in each return line for each circuit in multicircuit systems.

E. All branches from main piping (including mains that serve different wings or buildings) shall be provided with isolation valves.

F. Air vents shall be installed where indicated, and on all high points and piping offsets where air can collect or pocket.

1. Water air vents shall be high capacity type, automatic or manual, as specified and shown on drawings. For glycol systems, discharge shall be piped for gravity flow into a funnel to glycol fill tank.

3.13 FIELD PAINTING AND COATING
A. Except as otherwise specified, ferrous metal shall be cleaned, prepared, and painted as specified in the PAINTING section. Exposed pipe covering shall be painted. Aluminum sheath over insulation shall not be painted unless otherwise noted.

3.14 HYDROSTATIC TESTS

A. Prior to flushing and cleaning and before the application of any insulation, hydrostatic tests shall be made in accordance with applicable ASME requirements. Coordinate with Owner’s Representative for witnessing of tests. Test reports shall be submitted to the Engineer and Owner’s Representative. The systems shall be proved tight for four (4) hour tests (with no loss in pressure) under gauge pressures of 1-1/2 times the working pressure specified, but not less than the following:

1. Water Piping 150 psi

B. Retesting: If any deficiencies are revealed during test, such deficiencies shall be corrected and the tests reconducted at no additional costs to the Owner.

3.15 PIPING SYSTEM, CLEANING AND FLUSHING

A. Supply all materials, labor and power required for cleaning and flushing. Cleaning shall be started only after all piping has been successfully hydrostatically tested and all systems have been completely connected up.

B. Piping Cleaning and Flushing

1. Exercise every precaution to avoid introducing foreign matter such as welding beads and slag or dirt into the piping system. All completed welds shall be hammered to loosen debris. All piping, valves and fittings shall be internally cleaned of oil, grease or dirt, prior to assembly into system by use of wire brush and swab.

2. All cleaning and flushing work shall be coordinated with and supervised by the Water Treatment Sub Subcontractor for chemicals and procedures to be followed. See the Water Treatment Section of these Specifications.

3. Following the successful testing of the piping systems, they shall be cleaned under the supervision of the Water Treatment Sub Subcontractor.

4. Before submitting piping systems for acceptance, all strainers shall be inspected and thoroughly cleaned.

5. Cleaning shall be started only after all piping has been hydrostatically tested and all systems have been completely connected up.

6. Operate pumps or provide other means of circulating water throughout system for period of 8 hours. At the end of circulation, remove and clean all strainer baskets and blow off all low points.
3.16 DUCTWORK

A. Installation shall be according to the standards referenced in PART 2 for the system. Duct supports for sheet metal ductwork shall be according to THE SMACNA HVAC DUCT CONSTRUCTION STANDARDS, 2ND ED., 1995, unless otherwise specified. Friction beam clamps indicated in THE SMACNA HVAC DUCT CONSTRUCTION STANDARDS, 2ND ED., 1995 shall not be used. Risers on high velocity ducts shall be anchored in the center of the vertical run to allow ends of riser to move due to thermal expansion. Supports on the risers shall allow free vertical movement of the duct. Supports shall be attached only to structural framing members and concrete slabs. Supports shall not be anchored to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided. Where C-clamps are used, retainer clips shall be provided.

B. Dust Control: To prevent the accumulation of dust, debris and foreign material during construction, temporary dust control protection shall be provided. The distribution system (supply and return and exhaust) shall be protected with temporary seal-offs at all inlets and outlets at the end of each day’s work. Temporary protection shall remain in place until system is ready for startup.

C. Power Transmission Components Adjustment: V-belts and sheaves shall be tested for proper alignment and tension prior to operation and after 72 hours of operation at final speed. Belts on drive side shall be uniformly loaded, not bouncing. Alignment of direct driven couplings shall be to within 50 percent of manufacturer's maximum allowable range of misalignment.

3.17 DUCTWORK LEAKAGE TEST

A. Ductwork leakage tests shall be performed for all duct systems (supply, return, outdoor and exhaust air systems, including fans, coils, etc.) that are designated as Static Pressure Class 3 inch water gauge or greater and all ductwork located outdoors. See Ductwork Pressure and Seal Class table on drawings for scope. Test procedures, apparatus, and reports shall conform to the SMACNA Leakage Test Manual using the maximum static pressure design for each duct system. The maximum allowable leakage rate is defined by the specified SMACNA Static Pressure and Seal Classes. Ductwork leak tests shall be completed with satisfactory results prior to applying insulation to ductwork exterior. Submit test reports to engineer and Owner’s Representative.

3.18 AIR AND HYDRONIC SYSTEMS BALANCING

A. General Requirements

1. The Contractor shall select AABC MN-1, NEBB-01, SMACNA-07 or ASHRAE 111 as the standard for providing testing, adjusting and balancing (TAB) of
air and hydronic systems. The selected standard shall be used throughout the project. Testing, adjusting, and balancing shall be accomplished by a firm certified for testing and balancing by Associated Air Balance Council (AABC), Testing, Adjusting, and Balancing Bureau (TABB), National Environmental Balancing Bureau (NEBB), or National Balancing Council (NBC).

B. Prior to testing, adjusting, and balancing, the Contractor shall verify that the systems have been installed and are operating as specified. Approved detail drawings and all other data required for each system and/or component to be tested shall be attached to system flow diagram documentation.

C. The Contractor shall verify that all balancing devices required during the field coordination phase and confirm during the construction phase that they are properly installed to permit testing, adjusting and balancing and that all duct leakage tests have been completed prior to testing, adjusting and balancing. The dampers used for balancing shall be remote from the diffusers and registers, unless the registers are directly attached to the mains. The Owner’s Representative shall be notified in writing of all equipment, components, or balancing devices, that are damaged, incorrectly installed, or missing, as well as any design deficiencies that will prevent proper testing, adjusting, and balancing. Testing, adjusting, and balancing shall not commence until approved by the Owner’s Representative. Instrumentation accuracy shall be in accordance with the standard selected in this paragraph.

1. The HVAC Subcontractor as a part of his contract shall provide all materials, labor and service of all Subcontractors for fulfillment of air and water balancing of all systems. The TAB Sub Subcontractor shall inform the HVAC Subcontractor of all requirements ahead of time.

2. Provide additional sheaves and belts required to reach design CFM levels.

3. In addition to the procedures outlined in this specification section, the procedures used for air, hydronic and temperature balancing shall also be in conformance with the "Procedural Standards for Testing, Adjusting, Balancing of Environmental System", seventh (2005) edition published by the National Environmental Balancing Bureau, the "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", fifth edition published by the Associated Air Balance Council or the Practical Standards and Procedures published by Testing, Adjusting, and Balancing Bureau or the National Balancing Institute.

4. A copy of the standards must be maintained on site by the Balancing Subcontractor at all times. The test report forms shall comply with the formats listed in these standards.

D. Recording of Existing Airflows

1. Prior to demolition, where shown on the drawings, take and submit flow readings at all existing diffusers (and volume damper positions), volume boxes and air handlers along with static pressure readings with the
systems set to full design airflow per this balancing spec. Include filter pressure drop and fan speed data. After new work is completed and balanced, rebalance the existing diffusers to their new or original airflows (as shown). Adjust existing volume boxes and air handlers as necessary to accommodate new and existing layout.

E. Instrument Accuracy Requirements

1. All instrumentation shall be checked for accuracy before beginning testing, adjusting and balancing procedures. Instrument accuracy shall be in accordance with the standard selected in Paragraph A. General Requirements, immediately above. Checks may be carried out against similar equipment maintained specifically for checking purposes or by the manufacturer or a recognized testing facility. All instrumentation used for testing shall be calibrated within 6 months of use. Pitot tubes and U-tube manometers do not require checking. In no case shall the instrumentation accuracy be less than specified by the instrument manufacturer. Any instrument falling out of calibration during the process of balancing and testing shall be recalibrated or removed from the site and replaced by a properly calibrated instrument. No instruments shall be allowed to remain on-site that are not in calibration.

F. Integral with the TAB standard followed, the TAB Contractor shall submit in the submittal phase the following documents:

1. Qualification data shall be submitted, 60 days prior to testing and balancing operations. The test and balance firm shall be certified by the Associated Air Balance Council (AABC), the National Environmental Balancing Bureau (NEBB), Testing, Adjusting, and Balancing Bureau (TABB), or the National Balancing Council (NBC). The lead balancing technician shall be qualified by AABC, NEBB or NBC and his qualification data shall include past experience on at least five similar projects. Provide proof of certification.

2. TAB Plan and preliminary timeline.

3. Individual system one-line flow diagrams with pertinent data (i.e., static pressure, velocities, CFM, GPM, etc.) indicated on the applicable flow diagram for all components. Diagrams shall be made for each individual air and hydronic system.

4. Six (6) copies of a preliminary TAB report, 30 days before balancing commences. The report shall be organized by specific systems and shall clearly identify each item of equipment to be tested, adjusted, and balanced. The appropriate test procedures and measurements to be taken for each item of equipment shall be listed. Instrument calibration records shall be provided on forms shown in AABC MN-1 or SMACNA-07. Manufacturer’s specified accuracy shall be shown. The report shall include floor plan drawings showing all dimensions of ductwork, piping and their related measurement locations and types of measurements to be made. All related data necessary for testing, balancing, and
adjusting, including fan and pump curves, actual and nameplate speeds, voltage and amp draw (each leg) shall be included. A system readiness checklist, similar to that shown in SMACNA-07, shall be included. The report shall contain a listing of the deficiencies of all systems to be tested, adjusted and balanced and the corrective action taken. The report shall contain a schedule for the final testing and balancing.

5. Six copies of the final TAB report on forms shown in AABC MN-1, SMACNA-07, or equivalent forms from NEBB or NBC, within 2 weeks after completion of the test and balance operation. Data shall be in a hard bound cover identifying the project name, location, date of submittal, name of Contractor, and a general title indicating the specific area and type of work, and shall be signed by a registered professional engineer, employed by the test and balance firm, who has a minimum of two years experience in testing, adjusting and balancing work. The final report shall include a summary of the preliminary report describing test methods, test results, and major corrective actions taken. The report shall include as-tested floor plans showing all measurement locations and types of measurements made. The air handling unit data shall include a static pressure profile diagram, and pitot tube traverses where possible. The VAV terminal data shall include maximum and minimum air flows, for design and actual conditions, and shall be supported with summaries which show the air outlet totals for each VAV terminal and the VAV terminal totals for each air handling unit. Air distribution data shall include coded drawings which show the exact location of each air outlet. Pump data shall include pump efficiency. Data for chillers, heating and cooling coils, and heat exchangers, shall include heat balance calculations.

6. All instruments that are recalibrated and brought back onto the jobsite after being found to be out of calibration shall have recalibration records submitted on forms shown in AABC MN-1 or SMACNA-07.

G. The facility shall be essentially complete with final ceiling, walls, windows, doors and partitions in place. Doors and windows surrounding each area to be balanced shall be closed during testing and balancing operations. Air systems shall be complete and operable with balancing dampers, ducting, diffusers, returns, flow control boxes and control components in place. Exhaust fans and any hoods shall be operational. Hydronic systems shall be complete and operable with balancing valves, flow meters, coils, pumps, piping and control components in place. All measurements and adjustments shall be made using procedures described in standard selected in paragraph GENERAL REQUIREMENTS. Air motion and distribution from air terminals shall be as shown. All data including deficiencies encountered and corrective action taken shall be recorded. If a system cannot be adjusted to meet the design requirements, the Contractor shall promptly notify the Owner’s Representative in writing.

H. Air Systems: Each system shall be adjusted until all flow quantities (supply, return, exhaust/relief, and outdoor air) are within plus 10% and minus 5%. Dampers shall be checked for tight shutoff. Air leakage around dampers shall be verified.
[Face and bypass dampers shall be set for air flow through coils.] [Multizone dampers shall be set for air flow through cooling coils.] Fire and smoke dampers shall be open. Fans shall be checked for correct direction of rotation and proper speed shall be verified. Fire and smoke dampers shall be tested at system design air flow to ensure proper closure in accordance with NFPA 90A and manufacturer's instructions prior to building occupancy.

1. Filters: Clean filters shall be installed at the beginning of the testing, adjusting, and balancing effort. For constant volume air handling units (no VFD), simulate the filters as ½ dirty by adding pressure drop (by temporarily adding cheese cloth or by other means). If the added P.D. is not listed in the schedules, confirm what to use with the engineer. For variable volume air handling units, simulate the filters as dirty (by temporarily adding cheese cloth or by other means). If the dirty P.D. is not listed in the schedules, confirm what to use with the engineer.

2. General Balancing Methods: In addition to the requirements for specific systems, flows in supply, exhaust and return air systems shall be balanced using the methods in standard selected in paragraph GENERAL REQUIREMENTS. Throttling losses shall be limited. Air flow adjustments shall be made by first adjusting the fan speed to meet the design flow conditions. Fan speed adjustment may not be required for fan motors which are less than 746 W, (one horsepower,) or if throttling results in no greater than an additional 5% of the kw draw above that required if the fan speed were adjusted. If the excess draw causes the motor to enter its service factor, fan speed shall be reduced accordingly. Flows and pressures shall be checked in all main risers and supply ducts at all supply, exhaust and return fan discharges. All flows shall be recorded before and after each adjustment.

3. Specific Systems: All special or additional procedures for testing and balancing shall be in accordance with the applicable requirements of the standard selected in paragraph GENERAL REQUIREMENTS.

a. If a system has diversity (variable flow), only the required quantity of balanced terminals shall be opened to meet the design air flow. For terminal boxes/valves, readings shall include minimum, maximum, and heating primary air flows. Fan powered terminal units shall include the previously listed primary air flows and the fan air flow.

b. Balancing of differential airflow: For areas such as kitchens, laboratories, hospitals and cleanrooms, in addition to balancing the individual supply, return and exhaust airflows, the pressurization air (positive or negative) shall also be maintained as shown on drawings (air in less air out) for each room.

I. Hydronic Systems: All valves and control components shall be open or set as required for maximum system flow. Each system shall be adjusted until all flow quantities are within plus/minus 10%. Pumps shall be checked for proper speed. Pump activation signal and deactivation signal valves shall be verified. Pump
motor current shall be checked at maximum design flow. Variable speed pumping systems shall be tested at a minimum of four separate flow conditions to simulate design diversity.

1. General Balancing Methods: In addition to the requirements for specific systems, flows in piping, coils and other hydronic system components shall be balanced using the flow meter, balancing valve, equipment or pump curve methods in accordance with the applicable provisions of the standard selected in paragraph GENERAL REQUIREMENTS. Flows shall be balanced in all flow bypasses, coils, heat exchangers, boilers, chillers, pump discharges and any locations where flow rate is indicated on drawings. Pressure taps on all pumps shall be made at factory suction and discharge tappings where available. All flows shall be recorded before and after each adjustment. Balancing is simplified where self adjusting Pressure Independent Automatic Control Valves (PIACV) or flow limiting valves (Griswold type) are used, as the balancer only needs to set (“dial in”) the flow and verify the valve flow setting on the device matches and is adjusted to the design equipment flow. If the PIACV or Griswold type device flow is not set to the equipment’s design flow, obtain directions for setting the flow with the BAS contractor (for PIACV’s) or mechanical contractor (for Griswold type devices) to make the adjustments required or, if the device can’t be set properly to have the device replaced with the a device that will give the required flow. Once the device has been set to the correct flow, verify that the valve pressure drop is within the valve’s control range per the manufacturer’s procedures. Where PIACV’s serve multiple coils, proportionally balance each coil to its percentage flow.

2. Specific Systems: Where specific systems require special or additional procedures for testing and balancing, such procedures shall be in accordance with the standard selected in paragraph GENERAL REQUIREMENTS. If a system has diversity, only the required quantity of wide-open terminals shall be used to meet the design water flow.

   a. Primary-Secondary: Primary-secondary systems shall be treated as separate systems. Primary systems shall be balanced first with the secondary systems running. Secondary systems shall then be balanced.

   b. Summer-Winter: Summer-winter systems shall be balanced in the summer mode of operation. Following completion of the summer-mode balancing, equipment used for winter operation shall be balanced.

   c. Four-Pipe Systems: Four-pipe systems shall be considered as two two-pipe systems, and balanced separately.

   d. If a system has diversity (variable flow), only the required quantity of balanced coil control valves shall be opened to meet the design pump flow.
J. Marking of Setting: Following final acceptance of certified reports by the Owner's Representative, the setting of all HVAC adjustment devices including valves, splitters, and dampers shall be permanently marked by the testing and balancing engineer so that adjustment can be restored if disturbed at any time.

K. Marking of Test Ports: The testing and balancing engineer shall permanently and legibly mark and identify the location points of the duct test ports. If the ductwork has exterior insulation, these markings shall be made on the exterior side of the ductwork insulation. All penetrations through ductwork and ductwork insulation shall be properly sealed to prevent air leakage or loss of vapor barrier.

L. Control Systems: Testing, adjusting, and balancing of the systems shall be coordinated with the control system installation. Work with the BAS Contractor for all balancing items shown on the control sequences such as airflow at air monitoring stations, outdoor airflow, and optimized setpoints for remote differential pressure sensors/transmitters (DPT) used for control of VFD's. Setpoint for DPT's shall be optimized to the lowest pressure required to provide design flow to all downstream terminal units with at least one unit's balancing device between 95% - 100% open on any of the terminal units on the pumping system. Where Pressure Independent Automatic Control Valves (PIACV) or self adjusting flow limiting valves (Griswold type) are used, optimize DPT setpoints such that the valve's pressure drop is no more than 50% above the lowest pressure in the valve's control range (typically 5 to 6 PSID for PIACVs or 2 PSID for flow limiting valves). All control components shall be verified to be properly installed and operating as specified before proceeding with testing, adjusting, and balancing. Verification shall be in accordance with AABC MN-1.

1. Adjustment of the temperature controls shall be coordinated by the person in charge of the balancing and adjusting and shall be performed coincidental therewith. In conjunction with the Controls Contractor simulate a complete cycle of operation for each system.

3.19 BASES AND SUPPORTS

A. In addition to supports and hangers as mentioned in the MISCELLANEOUS METALS section, provide all bases and supports not part of the building structure, of required size, type, and strength, as approved by the Architect, for all equipment and materials furnished by him. All equipment, bases and supports shall be adequately anchored to the building structure to prevent shifting of position under operating conditions.

B. All concrete foundations and all concrete supports will be provided by the General Contractor. The HVAC Subcontractor shall furnish shop drawings and templates for all concrete foundations and supports for setting all required hanger and foundation bolts and other appurtenances necessary for the proper installation of his equipment. All concrete work shall be shown in detail on the shop drawings prepared by the HVAC Subcontractor, and be submitted to the
Architect, showing the complete details of all foundations, including the necessary concrete and steel work and vibration isolation devices.

C. All floor-mounted equipment shall be erected on concrete pads over the complete floor area of the equipment, unless specified to the contrary herein.

3.20 WATERPROOFING

A. Pipes passing through slabs shall have the sleeve extended 1/4" above floors of finished spaces and 2" above floors of mechanical equipment rooms. The space between the pipe and sleeve shall be sealed with interlinking seals equal to Link-Seal.

B. Ducts through slabs shall have the sleeve extended 1/4" above floors of finished spaces and 2" above floors of mechanical equipment rooms. The space between the pipe and sleeve shall be caulked with lead wool. The top shall be sealed with lead and the bottom shall be sealed with monolastic caulking compound.

3.21 MISCELLANEOUS IRON AND STEEL

A. All work shall be cut, assembled, welded and finished by skilled mechanics. Welds shall be ground smooth. Stands, brackets, and framework shall be properly sized and firmly constructed.

B. Measurements shall be taken on the job and worked out to suit adjoining and connecting work. All work shall be by experienced metal working mechanics. Members shall be straight and true and accurately fitted. Scale, rust, and burrs shall be removed. Welded joints shall be ground smooth where exposed. Drilling, cutting and fitting shall be done as required to properly install the work and accommodate the work of other trades as directed by them.

C. Members shall be generally welded, except that bolting may be used for field assembly where welding would be impractical.

D. All shop fabricated iron and steel work shall be cleaned and dried and given a shop coat of paint on all surfaces and in all openings and crevices.

3.22 PLACING IN SERVICE

A. At the completion of performance tests and following approval of test result, recheck all equipment to see that each item is adequately lubricated and functioning correctly.

B. Furnish upon completion of all work, certificates of inspections from the manufacturers stating that authorized factory engineers have inspected and
tested the operation of their respective equipment and found same to be in satisfactory operating conditions.

3.23 CLEANING AND ADJUSTING

A. During the progress of the work, clean up and remove all oil, grease, and other debris caused by the work performed under this Section.

B. At the conclusion of the project, clean and repair all areas and finishes as installed or affected by this installation of work under this Section.

C. Pipes shall be cleaned free of scale and thoroughly flushed of all foreign matter. A temporary bypass shall be provided for all water coils to prevent flushing water from passing through coils. Strainers and valves shall be thoroughly cleaned. Prior to testing and balancing, air shall be removed from all water systems by operating the air vents. Temporary measures, such as piping the overflow from vents to a collecting vessel shall be taken to avoid water damage during the venting process. Air vents shall be plugged or capped after the system has been vented.

D. Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided for all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building. System shall be maintained in this clean condition until final acceptance. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

3.24 OPERATING AND MAINTENANCE INSTRUCTIONS

A. All operating equipment installed under this section shall be placed in operation and shall function continuously in an operating test for a period of one week without shutdown due to mechanical failure or necessity of adjustment. Prior to scheduling the Project Final Inspection and after completion of all installation and running adjustments, the HVAC Subcontractor shall perform all work required to place the equipment in complete operating condition to meet all requirements under this Specification.

B. During this running test period, the HVAC Subcontractor shall deliver to the designated representative of the Owner, through the Architect, six complete sets of operating, service and replacement data for all equipment which will require operating maintenance or replacement and one copy of this literature shall be available during the instruction of the operating personnel while the other is checked for completeness by the Architect.
3.25 COMMISSIONING

A. The contractor shall submit commissioning and commissioning plans including preliminary commissioning reports developed by a registered design professional or an approved agency in accordance with section C408.2 of the 2012 International Energy Conservation Code. The same registered design professional or approved agency shall provide evidence of mechanical systems commissioning and completion to the professional engineer stamping the HVAC drawings in accordance with the provisions of the code sections.

3.26 TRAINING

A. Conduct a training course for the maintenance and operating staff. The training shall start after the system is functionally complete but before the final acceptance tests. The training shall include all of the items contained in the operating and maintenance instructions as well as demonstrations of routine maintenance operations. The Owner’s Representative shall be given at least two weeks advance notice of such training.

B. During all working hours of the one week operating test, the HVAC Subcontractor’s instruction personnel shall be available for and provide thorough and detailed training to the Owner's operating and maintenance personnel in operation, maintenance and adjustment of all equipment installed. The instructions shall be videotaped by the Subcontractor. The master tape and one (1) copy shall be turned over to the Owner not more than 10 days following the completion of the training.

C. Give sufficient notice to the designated operating personnel of the Owner in advance of this period. Upon completion of instruction, obtain from such representatives written verification on that which the above mentioned instruction has been performed, such verification to be forwarded to the Architect.

D. Provide instruction time of 20 hours for systems and an additional 20 hours for ATC.

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.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert name of sub-bidder)

FSU PROJECT: ((Insert project number from top of page))

SUB-BID FOR SECTION: 260000 - ELECTRICAL

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Awarding Authority or may be obtained by written or telephone request.

3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Awarding Authority in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements: (None required under this Section.)

D. Reference Drawings: The Work of this Trade Bid is shown on the following Contract Drawings: E-0.01, E-1.01, E-1.02, E-1.03, E-1.04, E-1.05, E-1.06.

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. Relocation of existing card access devices.
2. Grounding and bonding of all electrical systems and equipment.
3. Power to HVAC equipment.
4. Power to electrified locks and doors.
5. Low voltage wiring to electrified locks and doors.
6. Testing of all electrical systems.
7. Coordination between electrical and other trades.
8. All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.
9. Core drilling for the Work of this Section.
10. Coordination drawings and record drawings and similar requirements.

B. Alternates: None

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
   1. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING:
      a. Power connections for control panels, pumps, fans, electric unit heaters.

D. The Electrical Sub-Contractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the electrical work.

1.3 SUBMITTALS

A. Comply with requirements specified in Division 01.

B. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:
   1. Overcurrent and switching devices.
   2. Wiring and cables.
   3. Conduit.
   4. Boxes and fittings.

1.4 REFERENCES

A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the drawings or specifications for electrical work carries with it the instruction to furnish, install and connect the item as part of the electrical work, regardless of whether or not this instruction is explicitly stated.

B. It shall be understood that the specifications and drawings for electrical work are complimentary and are to be taken together for a complete interpretation of the electrical work except that indications on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

1.5 REGULATORY REQUIREMENTS

A. Comply with all applicable federal and state laws, and all local codes, by-laws and ordinances.

B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Designer rules otherwise.
C. Request inspections from authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owner at the completion of the work.

D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements and regulations:
   1. State Building Code
   2. State Electrical Code
   3. National Fire Protection Association (NFPA)
   4. Local Town Regulations and By-laws
   5. Underwriter’s Laboratories, Inc. (UL)
   6. National Electrical Manufacturer’s Association (NEMA)
   7. American National Standards Institute (ANSI)

E. All electrical work shall meet or exceed any other state and local codes and/or authorities having jurisdiction (AHJ) including all other standards indicated herein.

1.6 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the electrical work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing, and do not proceed with the work required until written instructions have been issued by the General Contractor.

1.7 COORDINATION

A. Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet Architectural requirements.

B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work, and also furnish information and shop drawings necessary to permit trades affected by the work to install same properly and without delay.

D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer. Where the electrical work shall interfere with the work of other trades, assist in working out the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not
properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the electrical trades involved without extra cost to the Owner.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the electrical work, and repair all damages without extra cost to the Owner.

1.8 INSTALLATION REQUIREMENTS

A. The arrangement of all electrical work shown on the drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

B. Check the Electrical plans and specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Designer for his determination prior to proceeding with the work.

1.9 TYPICAL DETAILS

A. Typical details where shown on the drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Designer.

1.10 CORING, DRILLING

A. Comply with requirements specified in Division 01.

1.11 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

1.12 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required.
C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer’s published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction; all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

1.13 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

1.14 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment etc. necessary for the proper operation and maintenance of the mechanical and electrical systems until final completion of the work, at which time they shall be handed over to the Owner.

1.15 RECORD DRAWINGS, PROJECT CLOSEOUT

A. Comply with requirements specified in Division 01.

1.16 GUARANTEE/WARRANTY

A. Guarantee Work of this Section in writing for one year following the date of substantial completion by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Owner’s satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer’s published data without exclusion or limitation, in the Owner’s name.

1. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.

2. At nine months into the one-year guarantee period, the contractor shall perform a 100% test of all installed equipment. Any device and/or part found to be defective shall be repaired and/or replaced at no cost to the Owner. The Contractor shall notify the fire department one month in advance of the 100% test.

3. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.

4. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this contractor or a separate service organization. Choice of service
organization shall be subject to the Owner’s approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.

5. Submit copies of equipment and material warranties to the Owner before final payment.

6. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to the Owner.

7. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work by the Owner, and shall not initiate the guarantee period.

8. Non-durable items, such as electric lamps, shall be replaced up to the date of acceptance, such that they shall have had no more than 100 hours use prior to this date.

9. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately.

1.17 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Comply with requirements specified in Division 01.

B. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:

1. TABLE OF CONTENTS

2. Introduction
   a. Explanation of manual and its purpose and use.
   b. Description of the electrical systems.
   c. Safety precautions necessary for equipment.
   d. Illustrations, schematics and diagrams.
   e. Installation drawing.

3. Maintenance
   a. Maintenance and lubricating instructions.
   b. Replacement charts.
   c. Trouble shooting charts for equipment components.
   d. Testing instructions for each typical component.
   e. Two typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.

4. Manufacturer's Literature
   a. The equipment for which shop drawings have been submitted and approved.

1.18 QUALITY ASSURANCE

A. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
B. All work shall comply with the latest editions of the codes as referenced herein.

C. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.

D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.

E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

F. Equipment and materials shall:
   1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
   2. Be without blemish or defect.
   3. Not be used for temporary light and power purposes.
   4. Be in accordance with the latest applicable NEMA standards.
   5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

G. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

H. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:
   1. The coordination of their delivery.
   2. Their unloading from delivery trucks driven into any point on the property line at grade level.
   3. Their safe handling and field storage up to the time of permanent placement in the project.
   4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement if necessary shall be coordinated with Contractor who originally purchased the item.
   5. Their field make-up and internal wiring as may be necessary for their proper operation.
   6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
   7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

I. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the
reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.19 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products’ and manufacturer’s name. Materials in broken containers or in packages showing watermarks or other evidence of damage, shall not be used and shall be removed from the site.

1.20 FIRESTOPPING

A. Provide fire stopping for holes at conduit penetrations through floor slabs, fire rated walls, partitions with fire rated doors, corridor walls, and vertical service shafts in accordance with Division 07 FIRESTOPPING.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.

B. For purpose of establishing a standard of quality and not for purpose of limiting completion, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.

C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project and not part of a manufacturers standard product line will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers products will be unacceptable.

D. Where Specifications list manufacturer's names and/or “as approved” or “Equal approved by Designer, other manufacturers equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by Designer.

E. All materials shall be new and shall be UL listed.

2.2 RACEWAYS AND FITTINGS

A. Raceways - General:
   1. Acceptable Manufacturers:
b. Republic Steel and Tube.
c. Youngstown Sheet Tube Company.
d. Or approved equal.

2. Except for floor boxes, no conduit shall be allowed in elevated floor slabs. When connecting to a floor box, that conduit raceway shall take the shortest run in the floor slab.

3. No raceway shall be used smaller than 3/4" diameter. No conduit shall have more than three (3) 90 degree bends in any one run, and where necessary, pull boxes shall be provided. Intermediate metal conduit is not allowed.

4. Rigid metal conduit conforming to, and installed in accordance with, Article 346 of NFPA 70 shall be heavy wall zinc coated steel conforming to American Standard Specifications C80-1 and may be used for service work, exterior work, slab work, and below grade level slab, wet locations, and in mechanical rooms and where raceway may be subject to mechanical damage, i.e., loading docks, workshops, etc.

5. Thin wall conduit (EMT), conforming to, and installed in accordance with, Article 346 of NFPA 70 shall be zinc coated steel, conforming to industry standards, may be used in masonry block walls, stud partitions, above furred ceilings where exposed but not subject to mechanical damage, and shall be used for fire alarm work.

6. Flexible metal conduit shall be used for connections to recessed lighting fixtures and motors. Liquid tight flexible metal conduit shall be used for the above connections which are located in moist locations. All flexible connections shall include a grounding conductor.

7. Rigid non-metallic conduit may be used at the contractor’s option for underground electric and telephone services outside the foundation wall and shall be polyvinyl chloride (PVC) schedule 40. If option of rigid non-metallic conduit is exercised, underground runs outside the foundation wall shall be concrete encased at contractor’s expense.

8. PVC Schedule 40 may also be used for below slab circuits within building confines. Below slab rigid non-metallic conduits do not require concrete encasement. Rigid nonmetallic conduits shall not be used in slabs. Rigid steel elbows or stubs shall be used for penetrations from below slab or through exterior walls into building. PVC shall not be installed within building. Raceways and fittings shall be produced by same manufacturer.

B. Fittings:
1. Acceptable Manufacturers:
   a. O.Z.
   b. Crouse Hinds.
   c. Appleton.
   d. Or approved equal.

2. Provide insulated bushings on all raceways 1 inch diameter or larger.

3. Manufacturer’s standard fittings shall be used for raceway supports.

4. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.

5. Couplings for rigid metal conduit shall be threaded type.
6. Threadless fittings for EMT shall be watertight compression type. Set-screw type fittings are not acceptable. All fittings shall be concrete tight. No diecast fittings allowed except for raceways larger than 1 inch diameter.

7. Cable supports in vertical raceways shall be of the split wedge type. Armored cable supports for vertical runs to be of wire mesh basket design.

8. Wall entrance seals shall be equal to O.Z. Gedney type "WSK".

9. Couplings, elbows and other fittings used with rigid nonmetallic raceways shall be of the solvent cemented type to secure a waterproof installation.

2.3 WIRING MATERIALS 600V OR LESS

A. Acceptable Manufacturers:
   1. Southwire.
   2. Essex.
   3. General Cable
   4. Or approved equal.

B. Building Wire and Cable shall be 90 degree rated copper with 600V insulation, THHN, THWN-2 for branch circuitry and XHHW-2 for feeders.

C. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.

D. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.

E. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors white or gray. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.

F. Final connections to motors shall be made with 18" of neoprene sheathed flexible conduit.

G. Minimum branch circuit conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.

H. Fire alarm and security system wiring shall be #16 AWG twisted non-shielded pairs for alarm and trouble circuits and a minimum of #14 AWG for device power, control and alarm annunciation circuits.

I. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.
2.4 OUTLET, JUNCTION, PULL BOXES, AND WIRING TROUGHS FOR ALL SYSTEMS

A. Acceptable Manufacturers:
   1. Appleton.
   2. Crouse Hinds.
   3. Steel City.
   4. Or approved equal.

B. Outlets:
   1. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations shall be of cast-metal type having hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps not allowed in new construction.
   2. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of NFPA 70. Boxes shall not be less than 1-1/2" deep unless shallower boxes are required by structural conditions and are specifically approved by Designer. Ceiling and bracket outlet boxes shall not be less than 4" octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4" square or of comparable volume.

C. Pull and Junction Boxes:
   1. Where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish, and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code. Where intermediate cable supports are necessary because of box dimensions, provide insulated removable core brackets to support conductors. Junction boxes are to be equipped with barriers to separate circuits. Where splices are to be made, boxes shall be large enough to provide ample work space. All conductors in boxes are to be clearly tagged to indicate characteristics. Boxes shall be supported independently of raceways. Junction boxes in moist or wet areas shall be galvanized type. Boxes larger than 4 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

2.5 GROUNDING REQUIREMENTS

A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70.

B. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non-metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.
2.6 PHASING AND COLOR CODING

A. The insulation or covering of each wire or cable shall be color coded so as to provide for circuit identification as specified below.

<table>
<thead>
<tr>
<th>120/208 V Circuits</th>
<th>277/480V</th>
<th>Phase Circuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Brown</td>
<td>A</td>
</tr>
<tr>
<td>Red</td>
<td>Orange</td>
<td>B</td>
</tr>
<tr>
<td>Blue</td>
<td>Yellow</td>
<td>C</td>
</tr>
<tr>
<td>White</td>
<td>Grey</td>
<td>Neutral</td>
</tr>
<tr>
<td>Green</td>
<td>Green w/ yellow tracer</td>
<td>Equipment Ground</td>
</tr>
</tbody>
</table>

B. Color coding shall be achieved by one of the following methods:

1. The insulation or covering shall be coded during manufacture by use of one of the following methods:
   a. Colored compounds.
   b. Colored coatings.

2. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made.

C. The same colored cable shall be connected to the same phase throughout the project.

D. In general, building load centers and panelboards shall be phased “A”, “B”, “C”, left to right. The neutral, although it may be in different locations for different equipment, shall be identified.

2.7 MOLDED CASE CIRCUIT BREAKERS

A. Molded case type circuit breakers shall consist of manually operated quick make quick break mechanically trip free operating mechanisms for simultaneous operation of all poles, with contacts, arc interrupters and trip elements for each pole, all enclosed in molded phenolic plastic cases.

1. Their tripping units shall be of the “thermal magnetic” type having bimetallic elements for time delay overload protection and magnetic elements for short circuit protection.

2. They shall be manually operable by means of toggle type operating handles having “tripped” position midway between the “on off” position.

3. They shall each be contained in an individual case enclosing only the number of poles required for the particular breaker.

4. All panels and individually mounted circuit breakers shall have short circuit ratings exceeding the available short circuit or the values indicated in the Power System Studies in this section by a factor of 1.2 with a minimum as follows:
   a. 240V class panels/breakers shall be 22 kAIC.
   b. 480V Class Panels/Breakers shall be 65 kAIC.

5. They shall be of the “bolted in” type.
6. Where necessary, to accommodate other requirements, their frame sizes shall be increased to conform to such requirements, frame sizes being indicated only as a reference to the minimum acceptable interrupting ratings noted above.

7. Where single pole in trip sizes 20 amps or less, they shall be rated for switching duty.

8. They shall be equipped with 5 milliamp sensitivity ground fault interrupting features where so indicated.

B. Circuit breakers 150 amperes and below shall be thermal-magnetic trip with inverse time current characteristics. Breakers with 250 amperes frame shall be either thermal-magnetic or solid state trip.

C. Breakers with 400 amperes frame and above shall be Standard Micrologic (LSI) with solid-state trip unit and flux transfer shunt trip. Breakers shall have trip rating plugs with ratings as indicated on the drawings. Rating plugs shall be interlocked so they are NOT interchangeable between frames and interlocked such that a breaker cannot be latched with the rating plug removed.

D. Trip unit shall have adjustable short time setting with a fixed instantaneous override for circuit protection. Main breakers shall be provided with additional short delay trip time adjustment for increased system coordination.

E. Breakers shall have built-in test points for testing long delay, and instantaneous functions of the breaker by means of a 120 volt operated test kit.

F. Where indicated on the drawings, circuit breakers shall be UL listed and labeled for 100% application per NEC.

G. They shall be manufactured by Siemens, Cutler Hammer, General Electric or approved equal.

2.8 DISTRIBUTION SWITCHES

A. Acceptable Manufacturers:
1. Square D.
2. Eaton Cutler-Hammer.
4. Or approved equal.

B. Quick-make, quick-break type distribution switches shall equal or exceed the performance required for NEMA type heavy duty horsepower rated switches.
   1. They shall have arc quenchers and circuit breaker type pressure contacts.
   2. Where of the fusible type, they shall be designed for use with "Class R" fuses up to 600 amps.

C. Distribution switches shall be manufactured by Square D, Eaton Cutler-Hammer, or General Electric.

2.9 CARTRIDGE FUSES

A. Acceptable Manufacturers:
1. Bussman.
3. EFCO.
4. Or approved equal.

B. Cartridge fuses shall be as follows:
1. Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses.
2. Secondary system fuses, rated at 600 volts or less, shall be UL listed and constructed in conformance with the applicable standards set forth by NEMA and ANSI. All fuses of a particular class shall be of same manufacturer.
3. Regardless of actual fault current, they shall, at full recovery voltage, be capable of safely interrupting fault currents of 200,000 amperes RMS symmetrical or 340,000 amperes RMS asymmetrical, deliverable at the line side of the fuse.
4. Circuits 0–600 amperes shall be protected by the equal of Bussman "Low Peak" current limiting fuses, LPN-RK (250 volts), LPS-RK (600 volts), UL class RK-1.
5. Fuses shall be suitable for application to fuse gaps which reject other types of fusing.
6. Supply 10 per cent spare fuses of each size and type 60 amps and less. Supply three spare fuses for each size and type over 60 amps.

2.10 MOTOR CONTROLS

A. Acceptable Manufacturers:
1. ABB.
2. Siemens.
3. Cutler Hammer.
4. Or approved equal.

B. Combination Starters
1. Starters: combination type with fused disconnect switch with time delay dual element, 3 pole, UL Class RK-5 fuses as scheduled; full voltage, non-reversing magnetic starter unless otherwise shown or noted. Provide quick make, quick break disconnect. Starters shall have electronic resettable thermal overload elements for all three phases with settings sized for the actual final motor nameplate full load current. Minimum starter size shall be NEMA 1. For sizes 4 and above, provide electronic soft start system starter.
2. Each starter shall include:
   a. Hand-Off-Automatic selector switch unless otherwise shown or noted. HOA switch to be of a type that is field convertible to "On/Off" or "Auto/Off".
   b. A thermal element reset button.
   c. A red transformer type pilot light to indicate when the motor is running.
   d. A 120V holding coil.
   e. A 480/120V control transformer with primary and secondary fuse protection; of sufficient VA to handle the holding coil and associated controls. One leg of the transformer secondary shall be grounded.
   f. Two normally open and two normally closed auxiliary contacts.
   g. A nameplate engraved with motor identification and Horsepower.
h. Nameplate, HOA switch, reset button and pilot light shall be mounted in cubicle door. A door mounted keypad display with indicators, allowing user to program.

3. Each electronic solid state starter shall include the items indicated above, plus the following items:
   a. Ramp time, type of start, type of step. Display to show motor current, power factor, and fault status.
   b. Phase loss protection and phase reversal protection.
   c. The solid state starter shall utilize an 18 pulse converter design, to maintain minimal AC line distortion and low harmonics.
   d. The Solid State Starter and all components shall be rated to 100,000 AIC.
   e. The starter shall have an adjustable ramp start of 0.5 to 180 seconds, and an adjustable current limit of 0% to 85% of Locked Rotor Current. The starter shall also have an adjustable Soft Stop from 0 to 60 seconds.
   f. The starter shall have fault isolation, to automatically disconnect the power supply to protect the motor in the event of a semiconductor fault.
   g. The starter shall be equipped with an Electronic Timing Relay, adjustable from 0.1 to 60 seconds, to delay the start of the motor.
   h. Provide an elapsed Time Meter on door to indicate pump run time.

4. Finish: Fronts shall be made of cleaned phosphatized steel with rust-inhibiting primer and electro-deposited baked enamel finish, manufacturer's standard color.

C. Installation:
1. Verify compatibility of motor controllers and starters with motors supplied under mechanical and plumbing divisions 22 and 23. Review Division 22 and 23 shop drawings prior to ordering equipment to confirm actual sizing of: starters, disconnects, fuses, conduit, wire, breakers, etc. Make all required adjustments to the electrical equipment provided as needed to meet the submitted manufacturer's recommendations at no additional cost to the Owner.
2. Motor Controllers and Starters shall be installed level, plumb and anchored to the mounting surface in accordance with the manufacturer's instructions. The equipment shall be protected if stored during construction.
3. Seismic restraints: Provide anchor bolts, angle irons and fasteners to attach the combination starters rigidly to the building structure per IBC seismic requirements.
4. Inspect operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.
5. Touch-up scratched or marred surfaces to match original finish.
6. Clean interiors of motor controllers and starters prior to energization.

D. Labeling:
1. Where changes are made to existing motor controllers, provide new labeling to accurately reflect the changes; hand written revisions will not be acceptable.
2. Provide engraved nameplate for all motor controllers mounted on the outside face of the Controller; include the following minimum information:
   a. Name of Motor or Equipment Controlled.
   b. Source feeding Motor Controller.
   c. Voltage, NEMA starter size, number of phases.
d. Disconnect size in amps (where applicable), fuse size in amps (where applicable).

3. Engraved nameplates shall be have a black back ply, an inner white ply with outer colored ply as follows: Black for normal power, Red for Emergency (Legally Required or Optional Standby) power, Orange for UPS power.

E. Testing:
1. Perform inspection and testing as per NETA STD ATS for motor starters controlling motors 5 HP or larger; document and certify compliance with inspection and testing parameters.
2. Submit copies of inspection and testing to the Architect/Engineer for review and include in Owner O&M manuals.
3. When all motors are connected and the pre-energizing tests have been completed, the contractor shall operate the equipment to demonstrate that all control equipment and overcurrent protective devices perform as specified. Any deficiencies found shall be corrected and tests repeated. All test results and dates shall be recorded and submitted to the Engineer and the Owner’s Representative with statement certifying that the equipment is safe and ready for use.

2.11 ACCESS CONTROL

A. General
1. The General Contractor shall furnish and install the hard security system components, including mortise door prep, locksets, and door components (closers, operators, transfer hinges, panic hardware, etc).
2. The Electrical Sub-Contractor shall install the security control can(s) & control panel(s), batteries, power supply(s), composite cable between doors and security control panel, electrical components such as card readers, door contacts, Request to Exit devices, etc., wiring for power to Security Control Panel and Power Supply(s), including those installed at the doors.
3. The Electrical Contractor shall employ a certified Security Access System contractor to provide final low-voltage connections at door components, control panel(s) and power supply panel(s).
4. The Electrical Contractor shall employ a Software House iSTAR Pro certified technician to provide programming and commissioning of the electronic card access system.

B. Communication/Data
1. The security system technician will be responsible for disconnecting existing devices and terminating cabling for new devices in the control panel.

C. Cable
1. All cabling shall be plenum rated security composite cabling.
2. Banana peel structure to cable allows for separation at both field device end and head end equipment for connection to devices.
3. Contractor responsible for running the cable will leave the individual conductors within the cable at the various field device points per the wiring typical diagrams.
4. No intermediate splice points will be allowed. All wiring shall run from the head end to the field device.
5. All cabling shall be labeled with unique identifiers six (6) inches prior to each connection point.

6. All wiring in panels shall be neatly dressed and provide adequate slack for future maintenance and servicing.

7. A minimum of ten (10) feet of slack will be left at each termination point.

8. Basis of design: Smartwire Access Control Cable from Wind City Wire of Bolingbrook, IL, SMRTWRE Composite Cable PLNM, Item #4461030-S.

PART 3 - EXECUTION

3.1 BASIC REQUIREMENTS

   A. Adhere to best industry practice and the following.

3.2 TESTING REQUIREMENTS AND INSTRUCTIONS

   A. The Electrical Subcontractor shall provide supervision, labor, materials, tools, test instruments and all other equipment or services and expenses required to test, adjust, set, calibrate, and operationally check work and components of the electrical systems and circuitry throughout the work.

   B. The Electrical Subcontractor shall pay for all tests specified in this Section, including expenses incident to retests occasioned by defects and failures of equipment to meet specifications, at no additional cost to the Owner. Any defects or deficiencies discovered in any of the electrical work shall be corrected.

   C. The Electrical Subcontractor shall:
      1. Replace wiring and equipment found defective (defined as failing to meet specified requirements) at no additional cost to the Owner.
      2. Submit three copies of test results to the engineer.

   D. Do not void equipment warranties or guarantees by testing and checkout work. Checks and tests shall be supplemental to and compatible with the manufacturer's installation instructions. Where deviations are apparent, obtain the manufacturer's approved review of procedure prior to testing. Where any repairs, modifications, adjustments, tests or checks are to be made, the Contractor shall contact the engineer to determine if the work should be performed by or with the manufacturer's representative.

   E. All checks and tests specified for proper operating and safety of equipment and personnel are to be performed concurrent with progression of the work, prior to Final Acceptance by the Owner.

   F. Test are to:
      1. Provide initial equipment/system acceptance.
      2. Provide recorded data for future routine maintenance and trouble shooting.
      3. Provide assurance that each system component is installed satisfactorily and can be expected to perform, and continue to perform, its specified function with reasonable reliability throughout the life of the facility.
G. At any stage of construction and when observed, any electrical equipment or system determined to be damaged, or faulty, is to be reported to the engineer. Corrective action by the Contractor requires prior engineer approval, retesting, and inspection.

H. Prior to testing and start-up, equipment and wiring shall be properly and permanently identified with nameplates, and other identification as specified in this Section. Check and tighten terminals and connection points, remove shipping blocks and thoroughly clean equipment, repair damaged or scratched finishes, inspect for broken and missing parts and review and collect manufacturer’s drawings and instructions for delivery to the engineer. Make routine checks and tests as the job progresses to ensure that wiring and equipment is properly installed.

I. Testing and checkout work is to be performed with fully qualified personnel skilled in the particular tests being conducted. Personnel are to have at least five years of experience with tests of same type and size as specified.

J. Inspections and tests shall be in accordance with the following applicable codes and standards as amended to date, unless otherwise specified.
   1. National Electrical Manufacturer’s Association - NEMA.
   3. Institute of Electrical and Electronic Engineers - IEEE.
   4. National Electrical Testing Association - NETA.
   5. American National Standards Institute - ANSI.
      b. Z244-1: American National Standard for Personnel Protection.
   6. Insulated Cable Engineers Association - ICEA.
   7. Association of Edison Illuminating Companies - AEIC.
   8. Occupational Safety and health Administration.
      a. OSHA Part 1910; Subpart S, 1910.308.
      b. OSHA Part 1926; Subpart V, 1926.950 through 1926.960.
      a. 70B: Electrical Equipment Maintenance.
      b. 70E: Electrical Safety Requirements for Employer Workplaces.
      c. 70: National Electrical Code.
      d. 78: Lightning Protection Code.
   10. Inspections and tests shall utilize the following references:
       b. Contractor's Short Circuit and Coordination Study.
       c. Manufacturer's printed test procedures for respective equipment.

K. Test Equipment:
   1. Test equipment used by the Contractor is to be inspected and calibrated.
   2. Perform calibration and setting checks with calibrated test instruments of at least twice that of that of the accuracy of the equipment, device, relay or meter under test. Dated calibration labels shall be visible on test equipment. Calibrations over 6 months old are not acceptable on field test instruments. Inspect test instruments for
proper operation prior to proceeding with the tests. Record serial and model numbers of the instruments used on the test forms.

L. Test Procedures:
   1. The Electrical Subcontractor is responsible for the preparation of the procedures and schedules for the work specified herein. This work is to be coordinated and compatible with both the work and schedule of the other crafts. Sequence the tests and checks so that the equipment can be energized immediately after the completion of the application tests.
   2. Submit proposed testing and check out forms. The procedures shall provide specific instructions for the checking and testing of each electrical component of each system. Schedule tests and inspections as the job progresses. Test procedures submitted shall include job safety rules.

M. After each electrical system installation is complete, perform the tests to determine that the entire system is in proper working order and in accordance with applicable codes, manufacturer's instructions, drawings, and specifications. Tests are in addition to shop tests of individual items at the manufacturer's plant. Perform insulation and ground resistance tests before operating tests.

N. Perform insulation tests on electrical equipment, apparatus, cables, motors, generators, transformers, circuit breakers and switches, switchgear, motor control centers, and similar electrical equipment, at the following times and conditions:
   1. Prior to energization and/or placing into service.
   2. When damage to the insulation is suspected or known to exist.
   3. After repairs or modifications to the equipment affecting the insulation.
   4. Where lightning or other surge conditions are known to have existed on the circuit.

O. Make openings in circuits for test instruments and place and connect instruments, equipment, and devices, required for the tests. Upon completion of tests, remove instruments and instrument connections and restore circuits to permanent condition.

P. List each circuit and measured resistance as test data. Maintain record of insulation resistance values. Identify conductor, or equipment, date that value was taken and resistance value. Arrange information in tabular form and submit to Engineer.

Q. Report inspections, tests, and calibrations in writing on engineer-approved reports/forms. The recorded data form shall have the signatures of the persons conducting the tests, authorized witnesses, and the engineer. The forms shall serve as the test and inspection checklist.

R. When the electrical tests and inspections specified or required within this Section are completed and results reported, reviewed, and approved by the engineer, the Contractor may consider that portion of the electrical equipment system or installation electrically complete. The Contractor will then affix appropriate, approved, and dated completion or calibration labels to the tested equipment and notify the engineer of electrical completion. If the engineer finds completed work unacceptable, he will notify the Contractor in writing of the unfinished or deficient work, with the reason for his rejection, to be corrected by the Contractor. The Contractor will notify the engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification of Substantial Electrical Completion" for approval by the engineer following engineer's acceptance of
electrical completion. If later in-service operation or further testing identifies problems attributable to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.

3.3 BRANCH CIRCUITRY

A. For all lighting and appliance branch circuitry, raceway sizes shall conform to industry standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.

B. Circuits shall be balanced on phases at their supply as evenly as possible.

C. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.

D. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.

E. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one cable for each leg and one neutral cable, if any.

F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:
   1. All 20 amp, 120/208 volt, 3 phase, 4 wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.
   2. Minimum conductor size shall be No. 12 A.W.G. copper.
   3. Conductors operating at 120 volts extending in excess of 100 Ft., or at 277 volts extending in excess of 200 ft., or the last outlet or fixture tap shall be No. 10 A.W.G. copper throughout.
   4. Lighting fixtures and receptacles shall not be connected to the same circuit.
   5. Circuits shall be balanced on phases at their supply point as evenly as possible.

3.4 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS

A. Outlets and outlet size boxes shall be of galvanized cast ferrous metal only.

B. The finish of threaded steel conduit shall be galvanized only.

C. Wires for pulling into raceways for lighting and appliance branch circuitry shall be limited to "THWN".

D. Wires for pulling into raceways for feeders shall be limited to "THWN".

E. Plates for toggle switches and receptacles shall have gasketed snap shut covers suitable for wet locations while in use.

F. Final connections of flexible conduit shall be neoprene sheathed.

G. Apply one layer of half looped plastic electric insulating tape over wire nuts used for joining the conductors of wires.
H. Enclosures, junction boxes, pull boxes, cabinets, cabinet trims, wiring troughs and the like, shall be fabricated of galvanized sheet metal, shall conform to the following:
   1. They shall be constructed with continuously welded joints and seams.
   2. Their edges and weld spots shall be factory treated with cold galvanizing compound.
   3. Their connection to circuitry shall be by means of watertight hub connectors with sealing rings.

I. Enclosures for individually mounted switching and overcurrent devices shall be NEMA Class IV weatherproof construction.

J. The covers, doors and plates and trims used in conjunction with all enclosures, pull boxes, outlet boxes, junction boxes, cabinets and the like shall be equipped with gaskets.

K. Panels shall be equipped with doors without exception.

L. The following shall be interpreted as damp or wet locations within building confines:
   1. Spaces where any designations indicating weatherproof (WP) or vaporproof appear on the drawings.
   2. Below waterproofing in slabs applied directly on grade.
   3. Spaces defined as wet or damp locations by article 100 of the National Electric Code.

3.5 REQUIREMENTS GOVERNING ELECTRIC WORK IN AIR HANDLING SPACES

A. Within air handling duct work or plenums (other than spaces within suspended ceilings used for air handling purposes):
   1. Abide by the requirements specified for electric work in damp locations within building confines.
   2. Where circuitry passes through duct walls, include, in accordance with instructions issued in the field, air-tight sealing provisions which allow for a relative movement between the circuitry and the duct walls.
   3. Exclude the installation of type NM or NMC cable.

B. In spaces within suspended ceilings used for air handling purposes, abide by the requirements specified for normal electric work conditions except:
   1. Lighting fixtures recessed into the ceilings shall be certified as being suitable for this purpose.

3.6 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION

A. Perform the following work, in accordance with field instructions issued by the Designer to assure that minimal noise is produced by electrical installations due to equipment furnished as part of the electrical work.

B. Check and tighten the fastenings of sheet metal plates, covers, doors and trims used in the enclosures of electrical equipment.
C. Remove and replace any individual device containing one or more magnetic flux path metallic cores (e.g., discharge lamp ballast, transformer, reactor, dimmer, solenoid) which is found to have a noise output exceeding that of other identical devices installed at the project.

3.7 SUPPORTS AND FASTENINGS

A. Support work in accordance with best industry standards, Mass. Electric Code and the following:

B. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free standing position.

C. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.

D. No work intended for exposed installation shall be mounted directly on any building surface. In such locations, flat bar members or spacers shall be used to create a minimum of 1/4" air space between the building surfaces and the work. Provide 3/4" thick exterior grade plywood painted with two coats of fire-retardant grey paint for mounting of panelboards.

E. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.

F. Nothing shall rest on, or depend for support on, suspended ceiling media.

G. Support less than 2" trade size, vertically run, conduits at intervals no greater than 8 Ft. Support such conduits, 2-1/2" trade size or larger, at intervals no greater than the story height, or 15 Ft, whichever is smaller.

H. Where they are not embedded in concrete, support less than 1" trade size, horizontally run, conduits at intervals no greater than 7 ft. Support such conduits, 1" trade size or larger, at intervals no greater than 10 ft.

I. Support all lighting fixtures directly from structural slab, deck or framing member.

J. Where fixtures and ceilings are such as to require fixture support from ceiling openings frames, include in the electric work the members necessary to tie back the ceiling opening frames to ceiling suspension members or slabs so as to provide actual support for the fixtures noted above.

K. As a minimum procedure, in suspended ceilings support small runs of circuitry (e.g., conduit not in excess of 1 inch trade size) from ceiling suspension members as defined above. Support larger runs of circuitry directly from structural slabs, decks or framing members.

L. Fasten electric work to building structure in accordance with the best industry practice.

M. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.
N. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging tying to building structural elements.

O. As a minimum procedure, where weight applied to the attachment points is 100 lbs. or less, fasten to concrete and solid masonry with bolts and expansion shields.

P. As a minimum procedure, where weight applied to building attachment points exceeds 100 lbs., but is 300 lbs. or less, conform to the following:
   1. At field poured concrete slabs, utilize inserts with 20' minimum length slip-through steel rods, set transverse to reinforcing steel.

3.8 SPICING AND TERMINATING WIRES AND CABLES

A. Maintain all splices and joints in removable cover boxes or cabinets where they may be easily inspected.

B. Locate each completed conductor splice or joint in the outlet box, junction box, or pull box containing it, so that it is accessible from the removal cover side of the box.

C. Join solid conductors No. 8 AWG and smaller by securely twisting them together and soldering, or by using insulated coiled steel spring "wire nut" type connectors. Exclude "wire nuts" employing non-expandable springs. Terminate conductors No. 8 AWG and smaller by means of a neat and fast holding application of the conductors directly to the binding screws or terminals of the equipment or devices to be connected.

D. Join, tap and terminate stranded conductors No. 6 AWG and larger by means of solder sleeves, taps; and lugs with applied solder or by means of bolted saddle type or pressure indent type connectors, taps and lugs. Exclude connectors and lugs of the types which apply set screws directly to conductors. Where equipment or devices are equipped with set screw type terminals which are impossible to change, replace the factory supplied set screws with a type having a ball bearing tip. Apply pressure indent type connectors, taps and lugs utilizing tools manufactured specifically for the purpose and having features preventing their release until the full pressure has been exerted on the lug or connector.

E. Except where wire nuts are used, build up insulation over conductor joints to a value, equal both in thickness and dielectric strength, to that of the factory applied conductor insulation. Insulation of conductor taps and joints shall be by means of half-lapped layers of rubber tape, with an outer layer of friction tape; by means of half-lapped layers of approved plastic electric insulating tape; or by means of split insulating casings manufactured specifically to insulate the particular connector and conductor, and fastened with stainless steel or non-metallic snaps or clips.

F. Exclude splicing procedures for neutral conductors in lighting and appliance branch circuitry which utilize device terminals as the splicing points.

G. Exclude joints or terminations utilizing solder in any conductors used for grounding or bonding purposes.

H. Exclude all but solder or pressure indent type joints in conductors used for signaling or communications purposes.
I. Lugs for conductors used to make phase leg connections on the line side of the main service overcurrent and switching device shall be of the limiter type.

3.9 PULLING WIRES INTO CONDUITS AND RACEWAYS

A. Delay pulling wires or cables in until the project has progressed to a point when general construction procedures are not liable to injure wires and cables, and when moisture is excluded from raceways.

B. Utilize nylon snakes or metallic fish tapes with ball type heads to set up for pulling. In raceways 2’ trade size and larger, utilize a pulling assembly ahead of wires consisting of a suitable brush followed by an 3-1/2” diameter ball mandrel.

C. Leave sufficient slack on all runs of wire and cable to permit the secure connection of devices and equipment.

D. Include circular wedge-type cable supports for wires and cables at the top of any vertical raceway longer than 20 feet. Also include additional supports spaced at intervals which are no greater than 10’. Supports shall be located in accessible pull boxes. Supports shall be of a nondeteriorating insulating material manufactured specifically for the purpose.

E. Pulling lubricants shall be used. They shall be products manufactured specifically for the purpose.

F. Slack on wires and cables located in cabinets and pull boxes shall be formed and set in place in groupings corresponding to their occupancy of raceways. They shall also be arranged, with insulators and supports provided where necessary, such that cable shims or other such temporary expedients do not have to be left permanently in place to prevent the wires and cables from shifting when covers or trims are removed.

3.10 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES

A. Flush wall mounted outlet boxes shall not be set back to back but shall be offset at least 12’ horizontally regardless of any indication on the drawings.

B. Locate all boxes so that their removable covers are accessible without necessitating the removal of parts of permanent building structure, including piping, ductwork, and other permanent mechanical elements.

C. In conjunction with concealed circuitry, abide by one of the following instructions (as may be applicable to the conditions) in order to assure the aforementioned accessibility. (Not required for circuitry concealed by removable suspended ceiling tiles.)

1. For a small (outlet size) box on circuitry concealed in a partition or wall, locate box or fitting so that its removable cover side (or the face of any applied raised cover) penetrates through to within 1/8” of the exposed surface of the building materials concealing the circuitry and apply a blank or device plate to suit the functional requirements.

2. For a large box on circuitry concealed in a partition, suspended ceiling, or wall, locate box totally hidden but with its removable cover directly behind an architectural access door or panel (included for the purpose, separate from the electric work) in the building construction which conceals the circuitry.
3. For a small (outlet size) box on circuitry concealed above and intended as an outlet for a surface mounted lighting fixture or other such electrical item, locate box so that its removable cover side penetrates through to the exposed surface of the building materials concealing the circuitry. Arrange the mounting of the lighting fixture or other item so that it completely covers the opening in the building construction caused by the box.

4. For a small (outlet size) box on circuitry concealed in a suspended ceiling, and intended as an outlet for a non-demountable type of recessed lighting fixtures or other such electrical items, locate box totally hidden but with its removable cover not more than one foot away from the building construction opening occupied by the demountable items.

D. Apply junction and pull boxes in accordance with the following:
   1. Include pull boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled in.
   2. Include junction and pull boxes to assure a neat and workmanlike installation of raceways.
   3. Include junction and pull boxes to fulfill requirements pertaining to the limitations to the number of bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.
   4. Include all required junction and pull boxes regardless of indications on the drawings (which, due to symbolic methods of notation, may omit to show some of them).

E. Apply outlet boxes in accordance with the following:
   1. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device, lighting fixture and signal or communication system outlet component. Outlet boxes supplied attached to lighting fixtures shall not be used as replacements for the boxes specified herein.
   2. A continuous row of fixtures of the end-to-end channel type, designed for “through wiring,” and wired in accordance with the specification hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
   3. A series of separate fixtures, designed for “through wiring,” spaced not more than 4’ apart, and inter-connected with conduit or raceway and circuitry which is in accordance with the specifications hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
   4. Connection to recessed ceiling fixtures supplied with pigtails may be arranged so that more than one, but not more than four, such fixtures are connected into a single outlet box. When adopting this procedure:
      a. Utilize an outlet box no smaller than 5” square by 2-1/2” deep.
      b. Allow no fixture to be supplied from an outlet box in another room.
   5. Multiple local switches indicated at a single location shall be gang mounted in a single outlet box.
   6. Include all required outlet boxes regardless of indications on the drawings (which due to symbolic methods of notation, may omit to show some of them).

F. Install junction boxes, pull boxes and outlet boxes in accordance with the following:
   1. Exclude surface mounted outlet boxes in conjunction with concealed circuitry.
2. Exclude unused circuitry openings in junction and pull boxes. In larger boxes each such opening shall be closed with a galvanized sheet steel plate fastened with a continuous weld all around. In small outlet type boxes, utilize plugs as specified for such boxes.

3. Close up all unused circuitry openings in outlet boxes. Unused openings in cast boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock-out plugs.

4. Outlet boxes for switches shall be located at the strike side of doors. Indicated door swings are subject to field change. Outlet boxes shall be located on the basis of final door swing arrangements.

5. Boxes and plaster covers for duplex receptacles shall be arranged for vertical mounting of the receptacle.

6. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.

G. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.

H. Barriers in junction and pull boxes which are larger than outlet size shall be of the polyester resin fiberglass of adequate thickness for mechanical strength, but in no case less than 1/4" thick. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

3.11 LOCATING AND ROUTING OF CIRCUITRY

A. In general, all circuitry shall be run concealed except that it shall be run exposed where the following conditions occur:

1. Horizontally at the ceiling of permanently unfinished spaces which are not assigned to mechanical or electrical equipment.

2. Horizontally and vertically in mechanical equipment spaces.

3. Horizontally and vertically in electric equipment rooms.

B. Concealed circuitry shall be so located that building construction materials can be applied over its thickest elements without being subject to spalling or cracking.

C. All circuitry and raceways shall not be run within slabs. If field conditions requires raceways to be embedded in field poured structural building construction concrete fill or slab shall conform to the following:

1. All proposed embedded raceways shall be indicated on plan and elevation and submitted to the Structural Engineer for review and written approval prior to installation. Any costs associated with the review and approval shall be borne by the Electrical Subcontractor.

2. They shall be run "single layer" with their outside surface no closer than 1" to any surface of the structural concrete.

3. They shall not be located in any configuration which places the outside surface of one closer than 3" to the outside surface of another, except at tees, crosses or other single level wide angle junction points.

4. Where crossovers or close grouping are unavoidable, circuitry shall be carefully field coordinated so as not to cause structural weakness.
5. Where turned up or down into a wall or partition they shall, before entering same, be routed parallel for a long enough distance to assure that no relocation of the wall or partition will be necessary to conceal the required bend.

6. They shall be routed in such a manner as to coordinate with the structural requirements of the building.

7. They shall be routed in accordance with field instructions issued by the Designer where such instructions differ from specifications set forth herein.

D. Circuitry run exposed shall be routed parallel to building walls and column lines.

E. Exposed circuitry located overhead shall be run in a completely accessible manner on the underside of all piping and ductwork.

F. Circuitry run in suspended ceilings shall be routed parallel to building walls, column lines, etc.

G. Circuitry shall be routed so as to prevent electric conductors from being subject to high ambient temperature. Minimum clearances from heated lines or surfaces shall be maintained as follows:
   1. Crossing where uninsulated 3"
   2. Crossing where insulated 1"
   3. Running parallel where uninsulated 36"
   4. Running parallel where insulated 6"

H. Circuitry shall not be run in elevator shafts, hoistways, and the like. Where outlets for trail cables, pit lights, run be level lights, and the like, are involved, only the "final connection" outlet boxes themselves shall be located within or open into, the confines of the shaft.

I. Circuitry for miscellaneous systems indicated without notation as to location and routing shall be run as per the requirements and notations governing the adjacent light and power circuitry.

3.12 INSTALLING CIRCUITRY

A. The outside surface of circuitry which is to be embedded in cinder concrete shall be coated with asphaltum paint.

B. In runs of conduit or raceway including flexible limit the number of bends between cable access points to a total which does not exceed the maximum specified for the particular system. Where no such maximum is specified, limit the number to four right angle bends or the equivalent thereof.

C. In each conduit or raceway assigned for the future pulling in of wires, include a nylon drag cord. In raceways 2' trade size and larger, the cord shall be pulled in utilizing a suitable brush, followed by an 85% diameter ball mandrel ahead of the cord in the pulling assembly. In the event that obstructions are encountered, which will not permit the drag cord to be installed, the blocked section of raceway shall be replaced and any cutting and patching of the structure involved in such replacement shall be included as part of the electric work.
D. Circuitry shall be arranged such that conductors of one feeder or circuitry carrying "going" current are not separated from conductors of the same feeder or circuitry carrying "return" current by any ferrous or other metal. Where not within raceways, all "going" and "return" current conductors of one feeder or circuit shall be laced together so as to minimize induction heating of adjacent metal components.

E. Sleeves used where circuitry is to penetrate waterproof slabs, decks and walls, shall be of a type selected to suite the water condition encountered in the field.

END OF SECTION