The Commonwealth of Massachusetts

University of Massachusetts Amherst

Contract For

Morrill I and IV North 1st and 3rd Floor Microbiology Consolidation

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 Center, 100 Venture Way, Room 334, Hadley, MA, 01034 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.

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

PART I

INSTRUCTIONS TO BIDDERS

Instructions to Bidders

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Attachment B: Forms Used During Bidding

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. 17-10
Project No. 1007439
Title: Morrill I and IV north 1st and 3rd Floor Microbiology Consolidation

Category of Work: General Construction

Project Description and Scope:
Acoustical Tile, Plumbing, HVAC, Resilient Floors, Electrical & Painting
Note: Completion date based upon executed contract date is: April 15, 2018

Pre-Bid Meeting Information (if any):
April 26, 2017 at 9:00 a.m. at Morrill IV North Room N202,
639 N. Pleasant Street, Amherst, MA 01003-9248

Deadline for filing filed Sub-bids is 12:00 noon on May 10, 2017.
Deadline for filing General bids is 2:00 p.m. on May 17, 2017.
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 $50.00 per set payable to the University of Massachusetts. A refund will be made to those returning the documents in satisfactory condition within 10 working days after the general bid opening. Otherwise this deposit shall become the property of the University.

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

<table>
<thead>
<tr>
<th>Section #</th>
<th>Filed Sub-trade</th>
<th>All Bid Deposits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5% of Bid Amount</td>
</tr>
<tr>
<td>095113</td>
<td>Acoustical Tile</td>
<td></td>
</tr>
<tr>
<td>096500</td>
<td>Resilient Floors</td>
<td></td>
</tr>
<tr>
<td>099000</td>
<td>Painting</td>
<td></td>
</tr>
<tr>
<td>220001</td>
<td>Plumbing</td>
<td></td>
</tr>
<tr>
<td>230001</td>
<td>HVAC</td>
<td></td>
</tr>
<tr>
<td>260001</td>
<td>Electrical</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](http://www.umass.edu/procurement/constructionprojects.htm). Bidders may not rely upon oral communications or interpretations from the Awarding Authority or the Designer and the Awarding Authority shall not be bound by them.

4.2 It is the sole responsibility of the Bidder to ascertain the existence of any addenda issued by the Awarding Authority, as posted on the website. Copies of addenda will be made available for inspection at the locations listed in the Advertisement where the Contract Documents are on file.

4.3 Wherever in the Contract Documents reference is made to Massachusetts General Laws, it shall be construed to include all amendments thereto effective as of the date of the issuance of the invitation to bid on the proposed work.
SECTION 5 -- PREPARATION OF BIDS; ALTERNATES

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

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

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

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

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

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

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

5.8 Costs for subcontractors' bond premiums shall be paid for by the general Contractor in accordance with M.G.L. c. 149, § 44F unless the project is a project in which contractor and subcontractor prequalification are required pursuant to M.G.L. 149, §§ 44D1/2 or 44D3/4.
5.9 If the general Bidders are instructed to carry an amount for a given sub-trade listed under Item 2, general Bidders shall list the sub-trade and the amount provided by the Awarding Authority. The line under "bonds required" on the Form for General Bid should be left blank or marked "N/A" in order for subsection 5.10 to apply.

5.10 Upon solicitation of a subcontractor to perform the work required with respect to a sub-trade referenced in subsection 5.9, the general Bidder’s Contract Price shall be adjusted by the following: a) the difference between the subcontract amount and the amount carried in the general Bid; b) the total cost of the subcontractor’s bonds, if the general Bidder requires such bonds after the solicitation is completed and if the general Bidder complied with 5.9 above; c) the documented increased costs for the general Bidder’s bonds, if any, attributable to the incremental difference between the amount carried for the given sub-trade and the actual subcontract amount.

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

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

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

5.14 The amount of such bid deposit shall be 5% five per cent of the value of the Bid including alternates.
SECTION 6 - SUBMISSION OF BIDS

6.1 Each sub-Bid, including the bid deposit, Sub-Bidder Certificate of Eligibility and properly completed Sub-Bidder Update Statement shall be enclosed in a sealed envelope with the following plainly marked on the outside:

Filed Sub-Bid for:

UMA No. __________________________
Project No. __________________________
Title: ________________________________
Sub-Bid Section No. ________________
Trade: ______________________________
Sub-Bidders name, business address, and telephone number:

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

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

6.3 All Bids must be received by the Procurement Department at the address specified on page 8 of these Instructions to Bidders no later than the applicable date and time specified on page 8 of these Instructions to Bidders. Any Bid not received by the applicable deadline will not be accepted.

6.4 Bidding results will not be given out over the telephone prior to 1:00 PM of the day following the Bid opening.
SECTION 7 - WITHDRAWAL OF BIDS; REJECTION OF BIDS

7.1 Any Bid may be withdrawn prior to the specified deadline for the receipt of Bids provided that the withdrawal shall be made by a written request signed by a person having the authority to bind the Bidder. The written request must be hand delivered or otherwise delivered to the University of Massachusetts Amherst, Attn: Director of Procurement, Procurement Office, Mass Venture Center, 100 Venture Way, Room 334, Hadley, MA 01035 and must be received on or before the date and time appointed as the deadline for the receipt of Bids.

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

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

SECTION 8 - MBE AND WBE PARTICIPATION

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

8.2 The MBE and WBE participation goals for this Contract are as set forth on the first page of these Instructions to Bidders. The Awarding Authority reserves the right to reduce or waive the MBE or WBE participation goals established for this Contract upon written request made by a general Bidder within the time frame set forth in Section 8.3. Such written request must demonstrate to the satisfaction of the Awarding Authority that it is not feasible for a non-MBE or non-WBE general Bidder to meet the goals established for this Contract based upon any or all of the following: (i) actual M/WBE availability, (ii) the geographic location of the project to the extent related to M/WBE availability, (iii) the scope of the work, (iv) the percentage of work available for subcontracting to M/WBEs and/or (v) other relevant factors, including a documented inability by the prospective Bidder to obtain commitments from M/WBE subcontractors sufficient to meet the M/WBE goals after having made a diligent, good faith effort to do so. All of the foregoing documentation shall accompany the Bidder’s request for a reduction or waiver of the M/WBE participation goals. Such documentation shall include, at a minimum, the following:
-- A list of all items of work under the Contract that the Bidder made available for subcontracting to M/WBEs. The Bidder shall identify all items of work, other than work to be performed by filed sub-Bidders, that the Bidder did not make so available and shall state the reasons for not making such work available for subcontracting to M/WBEs. The Bidder shall also demonstrate that, where commercially reasonable, subcontracts were divided into units capable of being performed by M/WBEs.

-- Evidence that the Bidder sent written notices soliciting Bids or proposals to perform the items of work made available by the Bidder for subcontracting to M/WBEs to all M/WBEs qualified to perform such work. The Bidder shall identify (i) each M/WBE solicited, and (ii) each M/WBE listed in the SOMWBA directory under the applicable trade category that was not solicited and reasons therefor. The Bidder shall also state the dates that notices were mailed and provide a copy of the written notice(s) sent.

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

-- A statement of the response received from each M/WBE solicited, including the reason for rejecting any M/WBE who submitted a bid or proposal.
-- Evidence of efforts made to assist M/WBEs that needed assistance in obtaining bonding or insurance, or lines of credit with suppliers if the inability of M/WBEs to obtain bonding, insurance, or lines of credit is the reason given for the Bidder’s inability to meet the M/WBE goals.

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

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

**8.4** No later than five (5) working days after the opening of general Bids, the apparent low Bidder shall submit the following documents to the Awarding Authority's Compliance Office: (i) a completed Schedule for Participation by Minority/Women Business Enterprises ("Schedule for Participation") in the form provided by the Awarding Authority showing M/ WBE participation in amounts equal to or exceeding the M/WBE participation goals for this Contract, (ii) a completed Letter of Intent in the form provided by the Awarding Authority for each M/WBE listed in the Schedule for Participation, and (iii) a current SOMWBA certification letter for each M/WBE listed in the Schedule of M/WBE Participation showing that the M/WBE is certified in the area of work for which it is listed on the Letter of Intent.

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

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

**8.7** The Bidder’s attention is called to Article XIII of the General Conditions of the Contract which requires the Contractor to submit, within 30 days of the Contract Date, signed subcontracts with all subcontractors or a purchase order or invoice from each material supplier and/or manufacturer listed on the Schedule For M/WBE Participation.
8.8 A filed sub-Bidder is not required to submit a Schedule of M/WBE Participation with its Bid. A filed sub-Bidder may, at its option, submit a Letter of Intent with its Bid if it is a SOMWBA certified M/WBE. If a filed sub-Bidder intends to sub-subcontract work to a SOMWBA certified M/WBE, and the filed sub-Bidder wishes that sub-subcontract to be credited toward the participation goals for this Contract, the filed sub-Bidder should submit a Letter of Intent from that M/WBE with its Bid. A filed sub-Bidder can subcontract out up to 20% of its work to M/WBEs unless such work is designated as sub-sub contract Paragraph E work in the Bid Documents in which case the 20% cap does not apply.

SECTION 9 -- CONTRACT AWARD

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

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

9.3 The Contract will be awarded to the lowest responsible and eligible Bidder as determined by the Awarding Authority, except in the event of substitution as provided under M.G.L. c.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 original copies of each of the following documents prior to execution of the Contract by the Awarding Authority. All such documents shall be in the form prescribed by the Awarding Authority. Note: The successful general Bidder must submit its Schedule For Participation of
Minority/Women Business Enterprises and Letters of Intent as set forth in Section 8.4 above prior to Award of the Contract.
- Owner-Contractor Agreement
- Certificate of Corporate Vote
- Joint Venture Authorization (if appropriate)
- Performance and Payment Bonds with power of attorney attached
- Certificates of Insurance evidencing coverage in amounts required by the Contract

Documents

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

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

**10.3 Please note that no part of the General Contractor's work may be subcontracted without the prior written approval of the Awarding Authority.** If the General Contractor desires to subcontract any part of the Work, other than work covered by Item 2, filed sub-Bidders, the General Contractor must promptly forward to the Awarding Authority a list in triplicate designating the work to be performed and the name of each proposed subcontractor for approval by the Awarding Authority. Approved subcontractors are eligible for direct payments under M.G.L. 30, § 39F, as amended. Material suppliers not involving site labor need not be submitted for approval.

**SECTION 11 - RETURN OF BID DEPOSITS**

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

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

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

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

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

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

... The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in said section twenty-six, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, a pension plan and a supplementary unemployment benefit plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction "
ATTACHMENT 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: CONTRACTOR #05 6666
CONTRACTOR ADDRESS
CONTRACTOR CITY MA 00000

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

- Exterior Siding
- General Building Construction
- Painting

Your Single Project Limit is: $2,500,000
Your Aggregate Work Limit is: $5,000,000

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

-----------------------------------------------
George M. Matthews, Deputy General Counsel 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 10/16/2005 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 name if no number)       Business Address

[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)
• 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>
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</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>
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<td>[Enter Work Category]</td>
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<td>[Enter Work Category]</td>
<td>[Enter Contract Price]</td>
<td>[Enter Start Date]</td>
<td>[Date Completed]</td>
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</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.
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>
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Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above, either through a business or family relationship?  □ YES  □ NO

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

If you have answered YES to either question, explain: _____
PART 2 - CURRENTLY HELD CONTRACTS

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

<table>
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<th>1</th>
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<th>6</th>
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<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</td>
<td>ON SCHEDULE (yes / no)</td>
<td>CONTRACT PRICE</td>
<td>% NOT COMPLETE</td>
<td>$ VALUE OF WORK NOT COMPLETE (col. 5 x col. 6)</td>
<td>NO. OF YEARS REMAINING (see note below)</td>
<td>ANNUALIZED VALUE OF INCOMPLETE WORK (col. 7 / col. 8) (divided by)</td>
</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>
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<tbody>
<tr>
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</tr>
</tbody>
</table>

33
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>
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<tr>
<td>3. Has your firm failed or refused to complete any punch list work under any contract?</td>
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</tr>
<tr>
<td>4. Has your firm filed for bankruptcy, or has any officer, principal or individual with a financial interest in your current firm been an officer, principal or individual with a financial interest in another firm that filed for bankruptcy?</td>
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</tr>
<tr>
<td>5. Has your surety taken over or been asked to complete any of your work under any contract?</td>
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</tr>
<tr>
<td>6. Has a payment or performance bond been invoked against your current firm, or has any officer, principal or individual with a financial interest in your current firm been an officer, principal or individual with a financial interest in another firm that had a payment or performance bond invoked?</td>
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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.

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
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<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>
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<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>
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<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>
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<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>
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<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>
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<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>
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<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>
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<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>
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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.

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PART 6 - CHANGES IN BUSINESS ORGANIZATION OR FINANCIAL CONDITION

Have there been any changes in your firm’s business organization, financial condition or bonding
capacity since the date your current Certificate of Eligibility was issued?  □ Yes  □ No

If YES, attach a separate page providing complete details.

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

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

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

Effective March 30, 2010
Commonwealth of Massachusetts
Division of Capital Asset Management
SUB-BIDDER
UPDATE STATEMENT

TO ALL SUB-BIDDERS, TRADE CONTRACTORS AND AWARDING AUTHORITIES
A COMPLETED AND SIGNED SUB-BIDDER UPDATE STATEMENT MUST BE SUBMITTED WITH
EVERY FILED SUB-BID PURSUANT TO M.G.L. c.149, §44F AND EVERY TRADE SUB-BID PURSUANT
TO M.G.L. c. 149A. ANY FILED SUB-BID OR TRADE SUB-BID SUBMITTED WITHOUT AN
APPROPRIATE SUB-BIDDER UPDATE STATEMENT IS INVALID AND MUST BE REJECTED.
Caution: This form is to be used for submitting Filed Sub-Bids and Trade Sub-Bids. It is not to
be used for submitting Prime/General Contract bids.

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

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

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

[Project Number] [Enter Business Address]
Project Number (or 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

Page 1 of 10

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INSTRUCTIONS TO SUB-BIDDERS

- This form must be completed and submitted by allFiled 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.

Division of Capital Asset Management
Sub-bidder Update Statement Effective March 30, 2010

- The sub-bidder’s performance on the projected listed in Parts 1 and 2 must be part of your review. Contact the project references.
- AWARDING AUTHORITIES ARE STRONGLY ENCOURAGED TO REVIEW THE SUB-BIDDER’S ENTIRE CERTIFICATION FILE AT THE DIVISION OF CAPITAL ASSET MANAGEMENT. Telephone (617) 727-9320 for an appointment.

Correction of Errors and Omissions in Sub-bidder Update Statements

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

Correction of Other Defects: An awarding authority may, in its discretion, give a sub-bidder notice of minor defects and omissions as to form in the Sub-bidder’s Update Statement and provide an opportunity to correct its Sub-bidder Update Statement. However, the sub-bidder shall not be allowed to make corrections to a Sub-bidder Update Statement if material information about the sub-bidder was omitted from the Sub-bidder Update Statement filed with the sub-bidder’s bid. The Awarding Authority shall advise DCAM of any material omissions in a Sub-bidder’s Update Statement.. [810 CMR 8.13(2)].
PART 1 - COMPLETED PROJECTS

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

<table>
<thead>
<tr>
<th>PROJECT TITLE &amp; LOCATION</th>
<th>WORK CATEGORY</th>
<th>CONTRACT PRICE</th>
<th>START DATE</th>
<th>DATE COMPLETED</th>
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Attach additional sheets if necessary

* If your firm has been terminated from a project prior to completion of the work or has failed or refused to complete its work under any contract, full details and an explanation must be provided. See Part 3 of this Sub-bidder Update Statement.
PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH COMPLETED PROJECT LISTED ON THE PREVIOUS PAGE.

<table>
<thead>
<tr>
<th>PROJECT TITLE</th>
<th>COMPANY NAME</th>
<th>CONTACT PERSON</th>
<th>TELEPHONE</th>
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<tr>
<td>OWNER:</td>
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<td>DESIGNER:</td>
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<td>GC:</td>
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Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above, either through a business or family relationship?  □ YES  □ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship?  □ YES  □ NO  If you have answered YES to either question, explain: ______
PART 2 - CURRENTLY HELD CONTRACTS

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

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<th>7</th>
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<td><strong>WORK CATEGORY</strong></td>
<td><strong>START AND END DATES</strong></td>
<td><strong>ON SCHEDULE</strong></td>
<td><strong>CONTRACT PRICE</strong></td>
<td><strong>% NOT COMPLETE</strong></td>
<td><strong>$ VALUE OF WORK NOT COMPLETE</strong></td>
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Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above either through a business or family relationship?  

☐ YES  ☐ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship?  

☐ YES  ☐ NO

If you have answered YES to either question, explain: ________
**PART 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>
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<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>
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<tr>
<td>2. Has your firm failed or refused either to perform or complete any of its work under any contract prior to substantial completion?</td>
<td>☐</td>
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<td>3. Has your firm failed or refused to complete any punch list work under any contract?</td>
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<tr>
<td>4. Has your firm filed for bankruptcy, or has any officer, principal or individual with a financial interest in your current firm been an officer, principal or individual with a financial interest in another firm that filed for bankruptcy?</td>
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<td>5. Has your surety taken over or been asked to complete any of your work under any contract?</td>
<td>☐</td>
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<td>6. Has a payment or performance bond been invoked against your current firm, or has any officer, principal or individual with a financial interest in your current firm been an officer, principal or individual with a financial interest in another firm that had a payment or performance bond invoked?</td>
<td>☐</td>
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PART 4 - Legal or Administrative Proceedings; Compliance with Laws

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

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If you answer YES to any question, on a separate page provide a complete explanation of each proceeding or action and any judgment, decision, fine or other sanction or result. Include all details (name of court or administrative agency, title of case or proceeding, case number, date action was commenced, date judgment or decision was entered, fines or penalties imposed, etc.). IF YOU HAVE ANY DOUBT AS TO WHETHER TO ANSWER “YES” IT IS BETTER TO BE OVER INCLUSIVE AND TO PROVIDE A DETAILED EXPLANATION.

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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?  

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?  

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?  

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10. Has your firm been fined by OSHA or any other state or federal agency for violations of any laws or regulations related to occupational health or safety? Note: this information may be obtained from OSHA’s Web Site at www.osha.gov  

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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?  

13. Are there any other issues that you are aware which may affect your firm’s responsibility and integrity as a building contractor?
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PART 6 - CHANGES IN BUSINESS ORGANIZATION OR FINANCIAL CONDITION
Have there been any changes in your firm's business organization, financial condition or bonding capacity since the date your current Certificate of Eligibility was issued? □ Yes □ No
If YES, attach a separate page providing complete details.

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

Attach here a copy of the list of completed construction projects which was submitted with your firm's Application for your most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. The Attachment must include a complete copy of the entire Section F – “Completed Projects” (Section G – “Completed Projects” for firms certified based upon their Prime/General Application), and the final page – “Certification Page”, (Section I in the Sub-bidder Application or Section J in Prime/General Application) containing the signature and date that the Completed Projects list (Section F or G) was submitted to the Division of Capital Asset Management.
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. 17-10 Project No. 1007439

Project Name: Morrill I and IV North 1st and 3rd Floor Microbiology Consolidation

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.

\[ \text{total bid in words} \]

\[ \text{total bid in words} \]

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>
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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
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)

______________________________

($______________________________).

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>
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(Do not give bid price for any class or part thereof furnished by undersigned).
F. The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinbefore described Plans, Specifications and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the awarding authority.

G. The undersigned further agrees to be bound to the general Contractor by the terms of the hereinbefore describe Plans, Specifications, including all general conditions stated therein, and addenda, and to assume toward the general Contractor all the obligations and responsibilities that the general Contractor, by those documents, assumes toward the Commonwealth.

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

1. Have been in business under present business name ________ years.

2. Ever failed to complete any work awarded? ____________________________.

3. List one or more recent buildings with names of the general Contractor and Designer on which you served as a subcontractor for work of similar character as required for the above named building.

<table>
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<tr>
<th>Building</th>
<th>Designer</th>
<th>General Contractor</th>
<th>Amount of Contract</th>
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<td>(c)</td>
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</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: ____________
UNIVERSITY OF MASSACHUSETTS AMHERST

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:

N/A

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

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

By: _____________________________________________

Name: ___________________________________________

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 17-10

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>
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<td>7.</td>
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</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>
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</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 duly authorized meeting of the Board of Directors of the Corporation held on ________________, in ________________, a which a quorum was present and voting it was voted to authorize ________________, (Name) ________________, (Officer Title) to execute and deliver on behalf of the Corporation the following contract and to act as principal to execute bonds in connection therewith, which contract and bonds were presented to and made a part of the records of said meeting:

UMA Number ___________________

Project Title: __________________________

I further certify that ________________, (Name of Corporate Officer) ________________, (Officer Title) is duly qualified and acting as ________________, (Name of Corporate Officer) ________________, (Officer Title) of the Corporation and that said vote 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 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:

__________________________________________________________________________, a Massachusetts joint venture

By: ____________________________________________, a Massachusetts corporation having a
principal place of business at ____________________________________________

__________________________________________________________________________, its general partner

By: ____________________________________________

Its: ____________________________________________

Hereunto duly authorized

Date: ____________________________________________

By: ____________________________________________

Its: ____________________________________________

Hereunto duly authorized

Date: ____________________________________________

(Note: This certificate may have to be modified depending upon the terms of the joint venture agreement.)
CERTIFICATE OF COMPLIANCE WITH STATE 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:_________________________________________________________________
UNIVERSITY OF MASSACHUSETTS AMHERST

FORM FOR SUBCONTRACT – M.G.L. c. 149, s. 44F

THIS AGREEMENT made this ___________ day of ___________ 20__ by and between

______________________________________________________________

a corporation organized and existing under the law of ____________________________

a partnership consisting of _____________________________________________

an individual doing business as ___________________________________________

hereinafter called the “Contractor” and _______________________________________

______________________________________________________________

a corporation organized and existing under the 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 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)
GENERAL CONDITIONS OF THE CONTRACT

General Conditions of the Contract
Appendix A: -- Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program
Appendix B: -- Goals for Participation by Minority Business Enterprises and Women Business Enterprises
Appendix C: -- Commonly Used Forms
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   Daily Time and Material Report for Change Orders
   Notice of Intent
   Request and Agreement for a Change in the Plans, Specifications and/or Contract (UMA Form 5)
   Instructions Regarding Change Orders and Contract Modifications (DCAM Form 13)
   Contractor's Weekly Workforce Report
   Minorities/Women in Contractor's Weekly Workforce Report
   Weekly Payroll Report Form and Statement of Compliance
   Quarterly Projected Workforce Table
   Certification of Payment by Contractor to MBE/WBE and Instructions
   Certificate of Completion by Minority/Women Business Enterprise
   Form for Transfer of Title (Work Not Incorporated, UMA Form 16)
   Certificate of Agency Use and Occupancy – E-1
   Certificate of Final Inspection, Release and Acceptance – E-2
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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

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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.

**Nault Architect - Stephen VanDyke,**

**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.

Gaetan Blais 413-545-6508

**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.

   A. The Contractor at its sole cost shall take out and pay for all approvals, permits, certificates and licenses required by Laws, pay all charges and fees, and pay for (or cause the appropriate Subcontractor to pay for) all utilities required for the proper execution of the Work.
   B. The Contractor shall comply with all Laws and shall give all notices required thereby.
   C. Except as otherwise specified in this Contract, it is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable Laws. However, if the Contractor observes that portions of the Contract Documents are at variance with the requirements of Laws, the Contractor shall promptly notify the Designer and Awarding Authority in writing, and necessary changes shall be accomplished by an appropriate Contract Modification.
   D. If the Contractor performs Work knowing it to be contrary to Laws without giving such notice to the Designer and Awarding Authority, the Contractor shall bear full responsibility for such Work and all costs attributable thereto, including, without limitation, corrections to the Work.

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

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

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

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

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

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

   *(Note: If existing sanitary facilities at the Site are to be used by the Contractor, this requirement will be modified accordingly in the Supplementary General Conditions or Specifications.)*
11. **Contract Documents and Samples at the Site.**
A reasonable number of sets of Contract Documents, as defined by the Awarding Authority, will be furnished to the Contractor by the Awarding Authority immediately after signing of the Contract, one of which shall be maintained at the Site for reference by authorized representatives of the Awarding Authority. The Contractor shall maintain at the Site for the use and information of the Awarding Authority one record copy of the Drawings, Specifications, Addenda, Change Orders, Approved Shop Drawings, Product Data, Samples, updated Progress Schedule, and all other submittals, all in good order and marked currently to record changes and selections made during construction. These shall be available to the Designer and the Awarding Authority and shall be delivered to the Designer for submittal to the Awarding Authority upon completion of the Work.

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

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

B. For these purposes, the Contractor shall:
   (1) Comply with 84 Stat. 1590, the "Occupational Safety and Health Act of 1970" (OSHA) and with regulations and standards issued by the U.S. Secretary of Labor at 29 CFR Part 1926; and
   (2) Include the terms of this Section 14 in every subcontract so that such terms will be binding on each subcontractor.
   (3) Designate by notice to the Awarding Authority a responsible member of its organization at the Site whose duties shall include ensuring safety, implementation of Contractor’s Safety Plan referenced below and preventing accidents.

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

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

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

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

G. Without limiting the foregoing provisions of this Section 14, the Contractor shall comply with all health and safety Laws applicable to the Work. Without limitation,
   (1) If the Contractor uses, stores or encounters toxic or hazardous substances it shall comply with M.G.L. c. 111F, s. 2, the "Right to Know" law and regulations promulgated by the Department of Public Health, 105 CMR 670, the Department of Environmental Protection, 310 CMR 33, and the Department of Labor and Workforce Development, 441 CMR 21; and shall post a Workplace Notice obtainable from the Department of Labor and Workforce Development.
   (2) The Contractor shall comply with the Federal Resource Conservation and Recovery Act, the Federal Comprehensive Environmental Response, Compensation and Liability Act, M.G.L. c. 21C, M.G. L. c. 21E, and any other Laws affecting toxic or
hazardous materials, solid, special or hazardous waste (collectively "Hazardous Materials Laws"). Should the Contractor discover unforeseen materials subject to Hazardous Materials Laws at the Site, the Contractor shall immediately comply with any and all requirements for dealing with such materials and notify all required governmental authorities and the Awarding Authority of such discovery.

(3) The Contractor shall be responsible for the location of all utilities in connection with the Work. Without limiting the foregoing, the Contractor shall comply with Dig-Safe Laws. Dig-Safe is the Utility Underground Plant Damage Prevention System, 331 Montvale Road, Woburn, MA, 01801, 1-888-344-7233. The Contractor shall notify Dig-Safe of contemplated excavation, demolition, or explosive work in public or private ways, and in any utility company right of way or easement, by calling 811 or online at http://www.digsafe.com.

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

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

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

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

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

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

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


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

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

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

D. Chemical Waste: Chemical waste shall be stored in corrosion resistant containers, removed from the Site, and disposed of not less frequently than monthly unless more frequently required by Laws, including without limitation hazardous materials laws, or by the Supplementary General Conditions or Specifications. Disposal of chemical waste shall be performed in accordance with requirements of the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP). Fueling and lubricating of vehicles and equipment shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants shall be disposed of in accordance with procedures meeting all applicable Laws. The Contractor shall immediately notify the Designer of any hazardous materials release large enough to require reporting under applicable Laws. The Contractor shall be responsible for immediately cleaning up in accordance with Laws any oil or hazardous materials releases resulting from its operations. Any costs incurred in cleaning up any such releases shall be borne by the Contractor.
15. **Weather Protection (M.G.L. c. 149, s. 44G and 44F(1)).**
The Contractor shall furnish and install "weather protection," which means temporary protection of that Work adversely affected by moisture, wind and cold. Weather protection shall be achieved by covering, enclosing and/or heating working areas such that a minimum temperature of 40 degrees Fahrenheit is maintained at the working surface during the months of November through March in order to permit construction to be carried on during such period in accordance with the Progress Schedule. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials having a resistance comparable to the specified permanent construction, the Contractor shall provide heat therein of not less than 55 degrees F. nor more than 75 degrees F. The foregoing provisions do not supersede any specific requirements for methods of construction, curing of materials and the like. Such weather protection shall be consistent with the Progress Schedule, shall permit the continuous progress of the Work necessary to maintain an orderly and efficient sequence of construction operations, shall include one thermometer for every 2,000 square feet of floor space or fraction thereof, shall be subject to the Approval of the Awarding Authority, and shall meet such additional requirements as may be set forth in the Supplementary General Conditions or the Specifications.

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

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

18. **Sales Tax Exemption and Other Taxes.**
All building materials and supplies as well as the rental charges for construction vehicles, equipment and machinery rented exclusively for use on the Site, or while being used exclusively for the transportation of materials for the Work are entitled to an exemption from sales taxes under M.G.L. c. 64H, s. 6(f). The Contractor shall take all action required to obtain the benefit of
such sales tax exemption under the University of Massachusetts Amherst Form ST-5C Contractor’s Sales Tax Exemption, Purchase Certificate, E 043-167-352. The Contractor shall bear the cost of any sales taxes that Contractor incurs in connection with the Work and the Awarding Authority shall not reimburse the Contractor for any such taxes. A copy of the Form ST-5C is provided with this contract.

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

Subject to such additional requirements as may be provided in the Supplementary General Conditions or Specifications, the Contractor shall compile 3 complete and identical binders of operating and maintenance data for the entire Work. The Contractor shall submit record maintenance data to the Designer for approval, shall submit approved maintenance data to the Awarding Authority, and shall instruct and train the User Agency’s personnel in proper inspection and maintenance procedures.
21. **Closeout Procedures.**
The Contractor shall take all actions and submit all items required for the issuance of the Certificate of Agency Use and Occupancy and Final Acceptance as specified in the Contract Documents.

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

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

**ARTICLE V: MATERIALS AND EQUIPMENT**

1. **Materials Generally.**
   A. Unless otherwise specifically provided in the Contract Documents, the Contractor shall provide and pay for materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.
   B. Materials and equipment to be installed as part of the Work (both or either of which are hereinafter referred to as "materials") shall be new, unused, of recent manufacture, assembled, and used in accordance with the best construction practices. The Contractor shall inform himself as to, and shall comply with, the provisions of M.G.L. c. 7, s. 23A, as amended, and shall abide by the same and all applicable rules, regulations and orders made thereunder in relation to the purchase of supplies and materials in the execution of the Work, including the provisions of M.G.L. c.7, s. 22, paragraph 17 which provides that there be "a preference in the purchase of supplies and materials, other considerations being equal, in favor, first, of supplies and materials manufactured and sold within the Commonwealth, and, second, of supplies and materials manufactured and sold elsewhere within the United States."
2. Shop Drawings, Product Data, and Samples.

A. The Contractor shall furnish to the Designer all samples of the materials to be used in the execution of the Work as required by the Contract Documents. The Contractor shall furnish to the Designer in a timely manner all coordination Drawings, shop details, Shop Drawings, and setting diagrams which may be necessary for acquiring and installing materials. These shall be reviewed as required by the Designer. A minimum of six (6) copies shall be submitted for final approval, one of which shall be returned to the Contractor, one to the Resident Engineer, one to the Awarding Authority and one filed with the Designer. The inspection and approval by the Designer of Shop Drawings, etc. shall be general and shall in no way relieve the Contractor from responsibility for proper fitting, coordinating, construction, and construction sequencing. The Contractor shall furnish to the Designer such information and vouchers relative to the Work, the materials therefore, and the persons employed thereon, as the Designer shall from time to time request.

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

C. The Contractor shall review, approve, and submit to the Designer, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Awarding Authority or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents or which do not comply with the Contract Documents may be returned without action. The Contractor’s attention is directed to the provisions of Section 4 of this Article V and to the Specifications.

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

E. The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Designer. Such Work shall be in accordance with Approved submittals.

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

G. The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Designer’s approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Designer in writing of such deviation at the time of submittal and the Awarding Authority has given explicit written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by the Designer’s or the Awarding Authority’s actions.
H. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Designer on previous submittals.

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

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

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

3. Tests.

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

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

4. "Or Equal" Submissions.

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

B. The Contractor shall be responsible for providing the Designer with any information and test results that the Designer reasonably requires to determine whether or not a material is equal to a material named or described in the Contract Documents.
C. Whenever the Contractor submits a material for approval as a substitute for a material named or described in the Contract Documents, such submission shall be made at least one hundred twenty (120) days prior to the date the materials will be used in the Work. In no event shall the Contractor maintain a claim for delays based upon the Designer's review of such substituted materials if the Contractor has failed to comply with the one hundred twenty (120) day submission requirement.

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

5. Delivery and Storage of Materials; Inspection.

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

B. Materials stored off Site shall be insured and stored at the expense of the Contractor so as to guarantee the preservation of their security, quality and fitness for the Work. Without derogating from the Contractor's responsibilities in the previous sentence, when necessary to avoid deterioration or damage, material (on or off Site) shall be placed on wooden platforms or other hard clean surfaces and not on the ground and shall be properly protected.
C. Expenses for inspection of material by the Designer and/or the Awarding Authority personnel including travel, quarters, and subsistence shall be borne by the Contractor requesting the inspection of material stored outside the Commonwealth of Massachusetts as part of the Contract Price. The policy of the Awarding Authority precludes the payment for material stored outside the boundaries of Massachusetts except in extremely limited circumstances with the express written consent of the Awarding Authority. If the Contractor requests an inspection of material stored outside the Commonwealth of Massachusetts, the Awarding Authority will initially pay for all expenses of inspecting the material incurred by the Designer and/or Awarding Authority’s personnel including travel, quarters, and subsistence. The Awarding Authority will then give Contractor an invoice for those costs and the Contractor shall submit a credit Change Order for the amount of those expenses.

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

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

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

6. Defective, Damaged, or Deteriorated Materials and Rejection Thereof.

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

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

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

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

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

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

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

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

A. If liquidated damages are specified in the Owner - Contractor Agreement, the Awarding Authority has determined that its damages as a result of Contractor's failure to complete the Work to the point at which it qualifies for the issuance of a Certificate of Agency Use and Occupancy will be difficult or impracticable to ascertain. Accordingly, if the Work is not completed to such a point by the date specified in this Contract, the Contractor shall pay to the Awarding Authority the sum designated as liquidated damages in the Contract for each and every calendar day that the Contractor is in default in completing the Work to such point. Such moneys shall be paid as liquidated damages, not as a penalty, to cover losses and expenses to the Awarding Authority and/or the User Agency resulting solely from the fact that the Work is not completed on time.

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

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

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

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

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

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

3. Delays; Statutory Provisions (M.G.L. c. 30, s. 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. 39O set forth below, but nothing in provisions (a) and (b) shall alter any other rights which the Contractor or the subcontractor may have against each other. As used in the statutory language of (a) and (b) below, "contract" means this Contract, "general contractor" means the Contractor and " awarding authority" means the Awarding Authority:

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

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

4. Use and Occupancy Prior to Final Acceptance.
   A. The Contractor agrees to the use and occupancy of the Project or any portion thereof before Final Acceptance of the Work by the Awarding Authority.
   B. The Awarding Authority and the User Agency will cooperate with the Contractor with respect to the completion of the Work by taking such reasonable steps as may be possible to avoid interference with the Contractor’s Work provided that they do not interfere with the proper functioning of the facility.
   C. The Contractor shall not be responsible for wear and tear or damage resulting solely from temporary occupancy.
   D. Use and occupancy of any part of the Work prior to Final Acceptance by the Awarding Authority shall not relieve the Contractor from maintaining the required payment and performance bonds and insurance (to the extent that insurance is required to be maintained after Substantial Completion) required by this Contract.

   A. When the Work, or portion thereof which the Awarding Authority agrees to accept separately has reached the state of Substantial Completion as shown on Approved payment request, the Contractor shall develop, with the participation of the Designer and the Awarding Authority, the Punch List identifying those items of unfinished or unacceptable Work that remain to be performed or corrected under the Contract.
   B. Before the Work shall be deemed completed to the point where it is ready for the issuance of a Certificate of Agency Use and Occupancy, the Contractor shall:
      (1) Provide Contractor’s proposed Punch List containing a statement of the reason for each item listed thereon;
      (2) Advise the Awarding Authority of proposed changes in insurance in accordance with the provisions of this Contract, and provide to the Awarding Authority evidence of Contractor’s Completed Operations insurance coverage to the extent required by the Contract Documents;
(3) Execute and submit a notarized warranty on a form provided by the Awarding Authority meeting the requirements of Article IX of these General Conditions of the Contract, to commence upon the date of the issuance of the Certificate of Agency Use and Occupancy for the Work or the designated portion thereof, unless otherwise provided in the Certificate of Agency Use and Occupancy;

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

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

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

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

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

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

(10) Complete start-up of systems and instruct User Agency personnel on proper operation and routine maintenance of all systems and equipment; obtain and submit to Agency personnel that start-up and instruction have been completed;

(11) Remove all remaining temporary facilities that are no longer needed, surplus materials, and debris; (the Contractor shall not remove construction offices and trailers without the prior Approval of the Awarding Authority);

(12) Submit final utility meter readings and similar information and advise the User Agency and the Awarding Authority of the change of responsibility for utility charges and payments upon the issuance of the Certificate of Agency Use and Occupancy;

(13) Complete final clean-up of all Work, restoration of damaged finishes, and replacement of all damaged and broken glass not listed on the Contractor's Punch List.

(14) Complete such other items as may be called for in the Supplementary General Conditions, if any, or in the Specifications.

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

6. **Final Acceptance of the Work.**

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

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

   **B.** Reinspection; Final Acceptance. After notification from the Contractor that all remaining contract exceptions, omissions and incompleteds 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

   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. 391 which provides criminal penalties for unauthorized deviations from the Plans and Specifications, and to M.G.L. c. 30, s. 39J and M.G.L. c. 7, s. 42E-42I. The Contractor’s attention is also directed to M.G.L. 266, s. 67B which provides criminal penalties for false claims by Contractor under this Contract:

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

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

C. Timely Decision By Awarding Authority (M.G.L. c. 30, s. 39P): "Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made."

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

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

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

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

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

ARTICLE VIII: PAYMENT PROVISIONS

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

2. **Payment Liabilities of Contractor.**
   A. The Contractor shall pay to the Owner all expenses, losses and damages, as determined by the Awarding Authority or the Designer, incurred in consequence of any default, defect, omission or mistake of the Contractor or his employees or Subcontractors or the making good thereof.
   B. If the Work (or a portion thereof) is not completed to Substantial Completion and the Contractor has not satisfied the requirements for the issuance of a Certificate of Agency Use and Occupancy by the date specified in Article 2 of the Owner - Contractor Agreement, the Contractor shall pay to the Owner liquidated damages as provided in Article VI, Section 2 of these General Conditions of the Contract.
3. Retention of Moneys by Awarding Authority.

A. The Awarding Authority may keep any moneys which would otherwise be payable at any time hereunder, and apply the same, or so much as may be necessary therefore, to (1) the Owner’s expenditures for the Contractor’s account, (2) to secure the Awarding Authority’s remedies against the Contractor for the Contractor’s breach of its obligations under this Contract or the breach of any person performing any part of the Work and (3) the payment of any expenses, losses or damages incurred by the Awarding Authority or any agency of the Commonwealth as a result of the failure of the Contractor to perform its obligations hereunder. The Awarding Authority may retain, until all claims are settled, such moneys as the Awarding Authority estimates to be the fair value of the Awarding Authority’s claims against the Contractor, and of all claims for labor performed or furnished and for materials used or employed in or in connection with the Work and for the rental of vehicles, appliances and equipment employed and for the employment of substitute contractors and labor in connection with the Work filed in accordance with M.G.L. c. 30, s. 39A and s. 39F. The Awarding Authority may make such settlements and apply thereto any moneys retained under this Contract.

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

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

4. Applications for Payment.

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

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

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

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

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

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

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

"Within fifteen days (30 days in the case of the commonwealth, including local housing
authorities) after receipt from the contractor, at the place designated by the awarding
authority if such a place is so designated, of a periodic estimate requesting payment of the
amount due for the preceding month, the awarding authority will make a periodic payment
to the contractor for the work performed during the preceding month and for the materials
not incorporated in the work but delivered and suitably stored at the site (or at some
location agreed upon in writing) to which the contractor has title or to which a
subcontractor has title and has authorized the contractor to transfer title to the awarding
authority upon certification by the contractor that he is the lawful owner and that the
materials are free from all encumbrances, but less (1) a retention based on its estimate of
the fair value of its claims against the contractor and less (2) a retention for direct
payments to subcontractors based on demands for same in accordance with the provisions
of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved
amount of the periodic payment. After the receipt of a periodic estimate requesting final
payment and within sixty-five days after (a) the contractor fully completes the work or
substantially completes the work so that the value of the work remaining to be done is, in
the estimate of the awarding authority, less than one percent of the original contract price,
or (b) the contractor substantially completes the work and the awarding authority takes
possession for occupancy, whichever occurs first, the awarding authority shall pay the
contractor the entire balance due on the Contract less (1) a retention based on its estimate
of the fair value of its claims against the contractor and of the cost of completing the
incomplete and unsatisfactory items of work and less (2) a retention for direct payments to
subcontractors based on demands for same in accordance with the provisions of section
thirty-nine F, or based on the record of payments by the contractor to the subcontractors
under this contract if such record of payment indicates that the contractor has not paid
subcontractors as provided in section thirty-nine F. If the awarding authority fails to make
payment as herein provided, there shall be added to each such payment daily interest at
the rate of three percentage points above the 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 (I) for contracts awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and received a subcontract as a result of that filed sub-bid or who is approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, (ii) for contracts awarded as provided in paragraph (1) of section thirty-nine M of chapter thirty shall mean a person approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, and (iii) for contracts with the commonwealth not awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.

(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposit as provided in subparagraph (6) by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (6) by a petition in equity in the superior court against the awarding authority and the general contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any subcontractor with the petition of one or more subcontractors or the same general Contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the
petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the general contractor are available for direct payment shall have a right to file a petition in court of equity against the awarding authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the awarding authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subparagraph (5) and in subparagraph (6).

(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part (iii) of subparagraph (5) and in subparagraph (6) any amount held under a trustee writ or pursuant to a restraining order or injunction.”

7. Contracts for Public Works Governed by M.G.L. c. 30, s. 39G:
The following statutory provision applies only to contracts for public works governed by M.G.L. c. 30, s. 39G: “Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and, water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor’s certification within the twenty-one day period, the contractor’s certification shall take effect as the awarding authority’s declaration that the work has been substantially completed.
Within sixty-five days after the effective date of a declaration of a substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one percent retainage on that work, including quantity, price and all but one percent retainage for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payments filed by subcontractors and not yet paid to subcontractors or deposit 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 hereinafter provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefore, whichever occurs first, provided that the awarding authority’s inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinafter 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 hereinafter 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 ⅚. 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

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— 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 & $1,000,000 each occurrence
      - Property Damage $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:
   - Worker's Compensation: Provide Statutory Minimum
   - Part One: $500,000 each accident
   - Employer's Liability: $500,000 disease per employee
   - Part Two: $500,000 disease policy aggregate

   B. If specified in Exhibit A to the Owner - Contractor Agreement the policy must be endorsed to cover United States Longshoremen & Harborworkers Act (USLHW), Maritime Liability for $1,000,000/$1,000,000, or Federal Employer’s Liability Act liability.

6. **Builder's Risk/ Installation Floater/Stored Materials.**
   A. The Contractor shall provide coverage against loss or damage on all Work included in this Contract in an amount equal to the Contract Price. Such coverage shall be written on an all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood (if the project is not in an "A" or a "V" flood Zone), windstorm, false work, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss. This policy and/or installation floater shall indicate if Stored Materials coverage is provided as required below.

   B. When Work will be completed on existing buildings owned by the Owner, the Contractor shall provide an installation floater, in the full amount of the Contract Price. Such coverage shall be written on an all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood (if the project is not in an "A" or a "V" flood Zone), windstorm, false work, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss. This policy and/or installation floater shall indicate if Stored Materials coverage is provided as required below.
C. The Contractor shall maintain insurance on delivered and/or stored material designated to be incorporated in the Work against fire, theft or other hazards. Any loss or damage of whatever nature to such material while stored at some approved off site location shall be forthwith replaced by the Contractor at no expense to the Awarding Authority.

D. The policy or policies shall specifically state that they are for the benefit of and payable to the Awarding Authority, Owner, the Contractor, and all persons furnishing labor or labor and materials for the Contract Work, as their interests may appear. The policy or policies shall list the Awarding Authority, Owner, the Contractor, and Subcontractors of any tier as named insured.

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

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

7. **Umbrella Coverage.**

The Contractor shall provide Umbrella Coverage in form at least as broad as primary coverage required by Sections 2, 3 and 5 of this Article in the following amount unless a higher amount is specified in Exhibit A to the Owner - Contractor Agreement, in which case the Contractor shall provide the higher amount:

- Contract Price: Umbrella Coverage:
  - Under $1,000,000  $2,000,000
  - $1,000,000 -- $5,000,000 $5,000,000
  - $5,000,001 -- $10,000,000 $10,000,000
  - $10,000,001 and over $25,000,000

8. **Additional types of Insurance.**

The Contractor shall provide such other types of insurance as may be required by Exhibit A to the Owner - Contractor Agreement.

**ARTICLE XV: INDEMNIFICATION**

1. **Generally.**

To the fullest extent permitted by law, the Contractor shall indemnify, defend (with counsel subject to the supervision of the Attorney General of the Commonwealth of Massachusetts as required by M.G.L. c. 12, s. 3) and hold harmless the Owner, Awarding Authority and Designer and their officers, agents, divisions, agencies, employees, representatives, successors and assigns from and against all claims, damages, losses and expenses, including but not limited to court costs and attorneys’ fees, arising out of or resulting from the performance of the Work, including but not limited to those arising or resulting from:

- labor performed or furnished and/or materials used or employed in the performance of the Work;
- violations by Contractor, any Subcontractor, or by any person directly or indirectly employed or used by any of them in the performance of the Work or anyone for whose acts any of them may be liable (Contractor, subcontractor and all such persons herein collectively...
called "Contractor's Personnel") of any Laws;
— violations of any provision of this Contract by any of Contractor's Personnel;
— injuries to any persons or damage to any property in connection with the Work;
— any act, omission, or neglect of Contractor's Personnel.

The Contractor shall be obligated as provided above, regardless of whether or not such claims, damages, losses and/or expenses, are caused in whole or in part by the actions or inactions of a party indemnified hereunder. In any and all claims by Contractor's Personnel against parties indemnified hereunder, the Contractor's indemnification obligation set forth above shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Article XV.

2. Designer's Actions.
The obligations of the Contractor under Section 1 above shall not extend to the liability of the Designer, its agents or employees, arising out of (i) the preparation or approval of maps, drawings, opinions, reports, surveys Change Orders, designs or specifications, or (ii) the giving of or the failure to give directions or instructions by the Designer, its agents to employees provided such giving or failure to give is the primary cause of the injury or damage.

The provisions of this Article XV are intended to survive Final Acceptance and/or any termination of this Contract.

ARTICLE XVI: PERFORMANCE AND PAYMENT BONDS

1. Contractor Bonds.
   A. The Contractor shall provide performance and payment (labor and materials) bonds in the form provided by the Awarding Authority, executed by a surety licensed by the Commonwealth of Massachusetts Division of Insurance. Each such bond shall be in the amount of the Contract Price.
   B. If at any time prior to final payment to the Contractor, the Surety:
      — is adjudged bankrupt or has made a general assignment for the benefit of its creditors;
      — has liquidated all assets and/or has made a general assignment for the benefit of its creditors;
      — is placed in receivership;
      — otherwise petitions a state or federal court for protection from its creditors; or
      — allows its license to do business in Massachusetts to lapse or be revoked;
then the Contractor shall, within 21 days of any such action listed above, provide the Awarding Authority with new performance and payment bonds as described in Paragraph A above. Such bonds shall be provided solely at the Contractor's expense.

2. **Subcontractor Bonds.**
   A. If the Contractor provided in its General Bid that any or all filed subcontractors shall provide the Contractor with payment and performance bonds for the full amount of their respective Subcontracts, then the costs for said bonds shall be the responsibility of the Contractor.
   B. If the Contractor provided in its General Bid that filed Subcontractors shall provide bonds, and subsequently waives the requirement, the Contractor shall give the Awarding Authority a written certification that the Contractor understands that if the filed Subcontractor defaults or is terminated, the Contractor shall have full responsibility for all costs and expenses related to said default or termination but shall be entitled to a credit adjustment to the Contract Price in an amount equal to the bond premium Contractor would have paid had Contractor required the filed Subcontractor to provide such bonds.

**ARTICLE XVII: TERMINATION OF CONTRACT**

1. **Termination for Cause.**
   A. The Awarding Authority may without prejudice to any other right or remedy deem this Contract terminated for cause if any of the following defaults shall occur and not be cured within three (3) days after the giving of notice thereof by the Awarding Authority to the Contractor and any surety that has given bonds in connection with this Contract:
      
      (1) The Contractor has filed a petition, or a petition has been filed against the Contractor with its consent, under any federal or state law concerning bankruptcy, reorganization, insolvency or relief from creditors, or if such a petition is filed against the Contractor without its consent and is not dismissed within sixty (60) days; or if the Contractor is generally not paying its debts as they become due; or if the Contractor becomes insolvent; or if the Contractor consents to the appointment of a receiver, trustee, liquidate, custodian or the like of the Contractor or of all or any substantial portion of its assets and such appointment or possession is not terminated within sixty (60) days; or if the Contractor makes an assignment for the benefit of creditors;
      (2) The Contractor refuses or fails, except in cases for which extension of time is provided under this Contract's express terms, to supply enough properly skilled workers or proper materials to perform its obligations under this Contract, or the Designer has determined that the rate of progress required for the timely completion of the Work is not being met;
      (3) The Contractor fails to make prompt payment to Subcontractors or for materials, equipment, or labor;
      (4) All or a part of the Work has been abandoned;
      (5) The Contractor has sublet or assigned all or any portion of the Work, the Contract, or claims thereunder, without the prior written consent of the Owner, except as expressly permitted in this Contract;
(6) The Contractor has failed to comply with Laws;
(7) The Contractor fails to maintain, or provide to the Awarding Authority evidence of the insurance or bonds required by this Contract, or
(8) The Contractor has failed to prosecute the Work or any portion thereof to the standards required under this Contract or has otherwise breached any material provision of this Contract.

B. The Awarding Authority shall give the Contractor and any surety notice of such termination for cause, but the giving of notice of such termination shall not be a condition precedent or subsequent to the termination's effectiveness. In the event of such termination, and without limiting any other available remedies, the Awarding Authority may, at its option:

(1) hold the Contractor and its sureties liable in damages for a breach of Contract;
(2) notify the Contractor to discontinue all work, or any part thereof, and the Contractor shall discontinue all work, or any part thereof, as the Owner may designate;
(3) complete the Work, or any part thereof, and charge the expense of completing the Work or part thereof, to the Contractor;
(4) require the surety or sureties to complete the Work and perform all of the Contractor's obligations under this Contract.

If the Awarding Authority elects to complete all or any portion of the Work as specified in (3) above, it may take possession of all materials, equipment, tools, machinery, implements at or near the Site owned by the Contractor and finish the Work at the Contractor's expense by whatever means the Awarding Authority may deem expedient; and the Contractor shall cooperate at its expense in the orderly transfer of the same to a new contractor or to the Awarding Authority as directed by the Awarding Authority. In such case the Awarding Authority shall not make any further payments to the Contractor until the Work is completely finished. The Owner shall not be liable for any depreciation, loss or damage to said materials, machinery, implements or tools during said use and the Contractor shall be solely responsible for their removal from the Site after the Owner has no further use for them. Unless so removed within fifteen days after notice to the Contractor to do so, they may be sold at public auction, after publication of notice thereof at least twice in any newspaper published in the county where the Work is being performed, and the proceeds credited to the Contractor’s account; or they may, at the option of the Awarding Authority, be stored at the Contractor’s expense subject to a lien for the storage charges.

C. Damages and expenses incurred under paragraph B above shall include, but not be limited to, costs for the Designer's extra services and Project Representative services required, in the opinion of the Awarding Authority, to successfully inspect and administer the construction contract through final completion of the Work.

D. Expenses charged under paragraph B above may be deducted and paid by the Awarding Authority out of any money then due or to become due to the Contractor under this Contract.

E. All sums damages, and expenses incurred by the Owner to complete the Work shall be charged to the Contractor. In case the damages and expenses charged are less than the sum that would have been payable under this Contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference. In case such expenses shall exceed the said sum, the Contractor shall pay the amount of the excess to the Owner.
2. **Termination For Convenience.**

   **A.** The awarding authority may terminate this contract for convenience even though the Contractor is not in default by giving notice to the Contractor specifying in said notice the date of termination.

   **B.** In case of such termination without cause, the Contractor shall be paid:

   1. all sums due and owing under this contract through the date of termination, including any retainage withheld to the date of termination, less any amount which the Awarding Authority determines is necessary to correct or complete the Work performed to the date of termination; plus
   2. a reasonable sum to cover the expenses which Contractor would not have incurred but for the early termination of the Contract, such as demobilization of the work force, restocking charges, termination fees payable to Subcontractors.

   **C.** The payment provided in paragraph B above shall be considered to fully compensate the Contractor for all claims and expenses and those of any consultants, Subcontractors, and suppliers, directly or indirectly attributable to the termination, including any claims for lost profits.

3. **Contractor’s Duties Upon Termination For Convenience.**

Upon termination of this contract for convenience as provided in Section 2 of this Article, the Contractor shall: (1) stop the Work; (2) stop placing orders and Subcontracts in connection with this Contract; (3) cancel all existing orders and Subcontracts; (4) surrender the Site to the Awarding Authority in a safe condition; (5) transfer to the Awarding Authority all materials, supplies, work in process, appliances, facilities, equipment and machinery of this Contract, and all plans, Drawings, specifications and other information and documents used in connection with this Contract.

**ARTICLE XVIII: MISCELLANEOUS PROVISIONS**

1. **No Assignment by Contractor.**

   The Contractor shall not assign by power of attorney or otherwise, or sublet or subcontract, the Work or any part thereof, without the previous written consent of the Awarding Authority and shall not, either legally or equitably, assign any of the moneys payable under this Contract, or Contractor’s claims hereunder, unless with the like consent of the Awarding Authority, whether said assignment is made before, at the time of, or after the execution of the Contract. The Contractor shall remain responsible for satisfactory performance of all Work sublet or assigned. Consent of the Awarding Authority shall not be deemed to constitute a representation or waiver of any right hereunder by the Awarding Authority as to the qualifications or the responsibility of the Contractor or Subcontractor(s).

2. **Non-Appropriation.**

   If the Awarding Authority is unable to obtain an appropriation of funds sufficient to discharge its obligations under this Agreement for any fiscal year during the term of this Agreement, the Awarding Authority shall not be obligated to make any further payments, and this Agreement
may be terminated immediately by either the Awarding Authority or the Contractor, provided that the Awarding Authority shall make payment to the Contractor for obligations incurred during the period for which funding was included in an annual or supplemental appropriation. Delay by the General Court in enacting an annual or supplemental appropriation bill shall not be grounds for termination of this Agreement pursuant to this Section, unless such annual or supplemental appropriation bill as enacted and signed by the Governor contains insufficient funding for obligations pursuant to this Agreement.

3. **Claims by Others Not Valid.**
No person other than the Contractor shall acquire any interest in this Contract or claim against the Awarding Authority or Owner hereunder, and no claim by any other person shall be valid except as provided in M.G.L. c. 30, s. 39F of the General Laws.

4. **No Personal Liability of Public Officials.**
No public official, employee, or agent of the Awarding Authority or Owner shall have any personal liability for the obligations of the Awarding Authority or Owner set forth in this Contract.

5. **Severability.**
The provisions of this Contract are severable, and if any of these provisions shall be held unconstitutional or unenforceable by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the other provisions of this Contract.

6. **Choice of Laws.**
This Contract shall be governed by the laws of the Commonwealth of Massachusetts for all purposes, without regard to its laws on choice of law. All proceedings under this Contract or related to the Project shall be brought in the courts of the Commonwealth of Massachusetts.

7. **Standard Forms.**
Unless directed otherwise in writing by the Awarding Authority, Contractor shall use the standard forms in use by the Awarding Authority and/or Division of Capital Asset Management and Maintenance appearing in Appendix C to these General Conditions of the Contract.

8. **No Waiver of Subsequent Breach.**
No waiver of any breach or obligation of this Contract shall constitute a waiver of any other or subsequent breach or obligation.

9. **Remedies Cumulative.**
All remedies of the Awarding Authority provided in this Contract shall be construed as cumulative and may be exercised simultaneously or in any order as determined by the Awarding Authority in its sole discretion. The Awarding Authority shall also be entitled as of right to specific performance and equitable relief including the right to an injunction against any breach of any of the provisions of this Contract.
Notices to the Contractor shall be deemed given when hand delivered to the Contractor's temporary field office at or near the Site, or when deposited in the U.S. mail addressed to the Contractor at the Contractor's address specified in the Owner - Contractor Agreement, or when delivered by courier to either location. Unless otherwise specified in writing by the Awarding Authority, notices and deliveries to the Awarding Authority shall be effective only when delivered to the Awarding Authority at the address specified in the Owner - Contractor Agreement and date-stamped at the reception desk or for which a receipt has been signed by the agent or employee designated by the Awarding Authority to receive official notices.
APPENDIX A to General Conditions of the Contract

The following provisions form Article XII of the General Conditions of the Contract where the University of Massachusetts Amherst is the Awarding Authority.

EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM.

1. Compliance Generally.
   For purpose of this Article, "minority" refers to Asians, Blacks, Western Hemisphere Hispanics, Native Americans, and Cape Verdeans; "Commission" refers to the Massachusetts Commission Against Discrimination. During the performance of this Contract, the Contractor and all of its Subcontractors (hereinafter collectively referred to as the Contractor) shall comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

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

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

   Pursuant to Executive Order 478 the Contractor and any subcontractors may not engage in discriminatory employment practices; and the Contractor must certify that it is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and commit to purchasing supplies and services from certified minority or women-owned businesses, small businesses, or businesses owned by socially or economically disadvantaged persons or persons with disabilities. These provisions shall be enforced through the contracting agency, the Operational Services Division, and/or the Massachusetts Commission Against Discrimination. Any breach shall be regarded as a material breach of Contract that may subject Contractor to appropriate sanctions. The Contractor shall comply with the provisions of Executive Order No. 246 entitled Revoking and Superseding Executive Orders Numbers 143 and 150, with respect to affirmative action programs for handicapped individuals, which is herein incorporated by reference and made a part of this Contract.
C. In connection with the performance of the Work, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age, sexual orientation, or sex, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, and in-service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age, sexual orientation, or sex. A purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for future public construction projects.

D. If the Contractor shall use any subcontractor on any work performed under this Contract, the Contractor shall take affirmative steps to negotiate with qualified minority and women subcontractors. These affirmative steps shall cover both pre-bid and post-bid periods. It shall include notification to the State Office of Minority and Women Business Assistance or its designee, while bids are in preparation, of all products, work or services for which the Contractor intends to negotiate bids. In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this Contract relative to non-discrimination and affirmative action.

E. As part of its obligation of remedial action under this Article, the Contractor shall maintain on this project not less than the percent ratio set forth in the Owner - Contractor Agreement of minority employee worker hours to total worker hours in each job category including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers, and those "classes of work" enumerated in M.G. L. c. 149, s. 44F.

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

3. Liaison Committee, Reports and Records.

A. At the option of the Awarding Authority, there may be established for the term of this Contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the Awarding Authority, the Commission and such other representatives as may be designated by the Commission in conjunction with the Awarding Authority. The Contractor (or his agent, if any, designated by him as the on-Site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

B. The Contractor shall prepare projected staffing tables on a quarterly basis. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be
furnished one week in advance of the commencement of the period covered, and also when updated, to the Awarding Authority and Liaison Committee. The Contractor shall prepare weekly reports in a form approved by the Awarding Authority of hours worked in each trade by each employee, identified as minority or non-minority. Copies of these shall be provided at the end of each such week to the Awarding Authority and to the Liaison Committee.

C. Records of employment referral orders, prepared by the Contractor, shall be made available to the Awarding Authority and to the Liaison Committee on request.

D. A designee of the Awarding Authority and a designee of the Liaison Committee shall each have right to access to the Site.

E. The Contractor shall comply with the provisions of M.G.L. c. 151B as amended, of the Massachusetts General Laws, both of which are herein incorporated by reference and made a part of this Contract.

F. The Contractor shall provide all information and reports required by the Awarding Authority or the Commission on forms and in accordance with instructions issued by either of them and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the Awarding Authority or the Commission to affect the employment of personnel. This provision shall apply only to information pertinent to the Owner's supplementary affirmative action Contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the Awarding Authority or the Commission as appropriate and shall set forth what efforts he has made to obtain the information.


A. Whenever the Awarding Authority, the Commission, or the Liaison Committee believes the Contractor or any Subcontractor may not be operating in compliance with the terms of this Article, the Commission shall directly, or through its designated agent, conduct an appropriate investigation, and may confer with the parties, to determine if such Contractor is operating in compliance with the terms of this Article. If the Commission or its agent finds the Contractor or any Subcontractor not in compliance, it may make a preliminary report on non-compliance, and notify such Contractor in writing of such steps as will in the judgment of the Commission or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the Commission may make a final report of non-compliance, and recommend to the Awarding Authority the imposition of one or more of the sanctions listed below. If, however, the Commission believes the Contractor or any Subcontractor has taken or is taking every possible measure to achieve compliance, it shall not make a final report of non-compliance. Within fourteen days of the receipt of the recommendations of the Commission, the Awarding Authority shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:

(1) The recovery by the Awarding Authority from the Contractor of 1/100 of 1% of the Contract award price or $1,000 whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the Awarding Authority from the Contractor, to be assessed by the Contractor as a back charge against the subcontractor, of 1/10 of 1% of the sub-Contract Price, or $400 whichever
sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;

(2) The suspension of any payment or part thereof due under the Contract until such time as the Contractor or any subcontractor is able to demonstrate his compliance with the terms of the Contract;

(3) The termination, or cancellation, of the Contract, in whole or in part, unless the Contractor or any Subcontractor is able to demonstrate, as approved by the Awarding Authority, within a specified time his compliance with the terms of the contract;

(4) The denial to the Contractor or any subcontractor of the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three years.

B. If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that it is in compliance with this Article, the Contractor may request the Awarding Authority, in consultation with the Commission, to suspend the sanctions conditionally, pending a final determination by the Commission as to whether the Contractor is in compliance. Upon final determination of the Commission, the Awarding Authority, based on the recommendation of the Commission, shall either lift the sanctions or impose them again.

C. Sanctions recommended by the Commission and enumerated under Section 4 above shall not be imposed by the Awarding Authority except after an adjudicatory proceeding, as that term is used M.G.L. c. 30A, has been conducted. No investigation by the Commission or its agent shall be initiated without prior notice to the Contractor.

D. Notwithstanding the provisions of 4A-4C above, if the Awarding Authority determines after investigation that the Contractor or any Subcontractor is not in compliance with the terms of this Article, it may suspend any payment or portion thereof due under the Contract until the contractor demonstrates to the satisfaction of the Awarding Authority compliance with the terms of this Article. This temporary suspension of payments by the Awarding Authority is separate from the sanctions set forth in Section 4A-4C of this Article above, which are determined by MCAD and recommend to the Awarding Authority. Payment may be suspended only after the Contractor and any other interested party shall have been given the opportunity to present evidence in support of its position at an informal hearing held by the Awarding Authority, and the Awarding Authority has concluded upon review of all the evidence that such penalty is justified. Payment shall not be suspended if the Awarding Authority finds that the Contractor made its best efforts to comply with this Article, or that some other justifiable reason exists for waiving the provisions of this Article in whole or in part.
APPENDIX B to General Conditions of the Contract

The following provisions form Article XIII of the General Conditions of the Contract where the University of Massachusetts Amherst is the Awarding Authority.

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

1. Goals.
   A. The goals for minority business enterprise and woman business enterprise participation established for this Contract are as set forth in the Owner - Contractor Agreement.
   B. The Contractor and all Subcontractors, sub-subcontractors, and materials suppliers shall comply with all of the terms and conditions of this Article, which include the provisions pertaining to M/WBE participation set forth in the Owner - Contractor Agreement in order to meet the M/WBE participation goals established for this Contract.

2. M/WBE Participation Credit.
   A. If the Contractor is itself an MBE or WBE, M/WBE participation credit shall be given in an amount equal to the entire Contract Price. If the Contractor is not an MBE or WBE, then M/WBE participation credit will be given for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.
   B. If the Contractor is a joint venture with one or more M/WBE joint ventures’, M/WBE participation credit shall be given to the joint venture as follows:
      (1) If the joint venture is certified by SOMBWA as an MBE or WBE, M/WBE participation credit shall be given in an amount equal to the entire Contract Price.
      (2) If the joint venture is not certified as an MBE or WBE by SOMWBA, M/WBE participation credit shall be given to the joint venture for the value of the Work that is performed by the M/WBE joint ventures’, and for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.
   C. If an M/WBE supplies but does not install equipment or materials, M/WBE participation credit shall be given only if the M/WBE supplier is regularly engaged in sales of equipment or supplies to the construction industry from an established place of business. M/WBE participation credit shall be given the full amount of the purchase order only if the M/WBE supplier manufactures the goods or substantially alters them before resale. In all other cases, M/WBE participation credit shall be given for 10% of the purchase order.
   D. MBE participation credit shall be given for the work performed by MBEs only, and WBE participation credit shall be given for the work performed by WBEs only. MBE participation may not be substituted for WBE participation, nor may WBE participation be substituted for MBE participation.
3. Establishing M/WBE Status.
   A. A minority owned business shall be considered an MBE only if it has been certified as a minority business enterprise by the State Office of Minority and Women Business Assistance ("SOMWBA").
   B. A woman owned business shall be considered a WBE only if it has been certified as a woman business enterprise by SOMWBA.
   C. Certification as a disadvantaged business enterprise ("DBE"), certification as an M/WBE by any agency other than SOMWBA, or submission of an application to SOMWBA for certification as an M/WBE shall not confer M/WBE status on a firm for the purposes of this Contract.

4. Subcontracts With M/WBEs.
   Within thirty (30) days after the award of this Contract, the Contractor shall (i) execute a subcontract with each M/WBE Subcontractor which has executed a Letter of Intent Approved by the Awarding Authority, (ii) cause its Subcontractors to execute a sub-subcontract with each M/WBE sub-subcontractor, and (iii) furnish the Awarding Authority with a signed copy of each such subcontract and sub-subcontract.

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

   A. If at any time during the performance of the Contract the Contractor determines or has reason to believe that a scheduled M/WMBE is unable or unwilling to perform its M/WBE Work, or that there has been or will be a change in any M/WMBE Work, or that the Contractor will be unable to meet the M/WBE participation goal(s) for this Contract for any reason, the
Contractor shall immediately notify the Awarding Authority Contract Compliance Office in writing of such circumstances.

B. Any notice of a change in M/WBE Work pursuant to subparagraph “A” above shall include a revised Schedule of M/WBE Participation, and additional or amended Letters of Intent and subcontracts, as the case may be.

7. Actions Required If There is a Reduction in M/WBE Participation.

A. In the event there is a change or reduction in any M/WBE Work which will result in the Contractor failing to meet the M/WBE participation goal(s) for this Contract, other than a reduction in M/WBE Work resulting from a Change Order initiated by the Awarding Authority, then the Contractor shall immediately undertake a diligent, good faith effort to make up the shortfall in M/WBE participation as follows:

(1) The Contractor shall identify all items of the Work remaining to be performed under the Contract that may be made available for subcontracting to W/MBEs. The Contractor shall send a list of such items of work to the Awarding Authority, together with a list of the remaining items of the Work that was not made available to M/WBEs and the reason for not making such work available for subcontracting to M/WBEs.

(2) The Contractor shall send written notices soliciting proposals to perform the items of the Work that may be made available for subcontracting to W/MBEs to all W/MBEs qualified to perform such work. The Contractor shall advise the Awarding Authority of (i) each W/MBE solicited, and (ii) each W/MBE listed in the SOMWBA directory under the applicable trade category who was not solicited and the reasons therefor. The Contractor shall also advise the Awarding Authority of the dates notices were mailed and provide a copy of the written notice(s) sent.

(3) The Contractor shall make reasonable efforts to follow up the written notices sent to M/WBEs with telephone calls or personal visits in order to determine with certainty whether the M/WBEs were interested in performing the work. Phone logs or other documentation must be submitted to the Awarding Authority evidencing this effort.

(4) The Contractor shall make reasonable efforts to assist M/WBEs that need assistance in obtaining insurance, bonds, or lines of credit in order to perform work under the Contract, and shall provide the Awarding Authority with evidence that such efforts were made.

(5) The Contractor shall provide the Awarding Authority with a statement of the response received from each M/WBE solicited, including the reason for rejecting any M/WBE who submitted a proposal.

(6) The Contractor shall take any additional measures reasonably requested by the Awarding Authority to meet the M/WBE participation goal(s) established for this Contract, including, without limitation, placing advertisements in appropriate media and trade association publications announcing the Contractor's interest in obtaining proposals from M/WBEs, and/or sending written notification to M/WBE economic development assistance agencies, trade groups and other organizations notifying them of the project and of the work available to be subcontracted by the Contractor to M/WBEs.
B. If the Contractor is unable to meet the M/WBE participation goals for this Contract after complying fully with each of the requirements of paragraph “A” above, and the Contractor is otherwise in full compliance with the terms of this Article, the Awarding Authority may reduce the M/WBE participation goals for this Contract to the extent that such goals cannot be achieved.

8. Suspension of Payment and/or Performance for Noncompliance.

A. If at any time during the performance of this Contract, the Awarding Authority determines or has reason to believe that (1) there has been a change or reduction in any M/WBE Work which will result in the Contractor failing to meet the M/WBE participation goal(s) for this Contract, other than a reduction in M/WBE Work resulting from a change in the Contract work ordered by the Awarding Authority, and (2) the Contractor has failed to comply fully with all of the terms and conditions of paragraphs 1 through 7 above, the Awarding Authority may:

(1) suspend payment to the Contractor of an amount equal to the value of the work which was to have been performed by an M/WBE pursuant to the Contractor’s Schedule of M/WBE Participation but which was not so performed, in order to ensure that sufficient Contract funds will be available if liquidated damages are assessed pursuant to paragraph 9, and/or

(2) suspend the Contractor's performance of this Contract in whole or in part.

B. The Awarding Authority shall give the Contractor prompt written notice of any action taken pursuant to paragraph A above and shall give the Contractor and any other interested party, including any M/WBEs, an opportunity to present evidence to the Awarding Authority that the Contractor is in compliance with the requirements of this Article, or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The Awarding Authority may invite SOMWBA and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken pursuant to this paragraph.

C. Upon a showing that the Contractor is in full compliance with the requirements of this Article, or that the Contractor has met or will meet the M/WBE participation goals for this Contract, the Awarding Authority shall release any funds withheld pursuant to clause A(1) above, and lift any suspension of the Contractor’s performance under clause A(2) above.

9. Liquidated Damages; Termination.

A. If payment by the Awarding Authority or performance by the Contractor is suspended by the Awarding Authority as provided in paragraph 8 above, the Awarding Authority shall have the following rights and remedies if the Contractor thereafter fails to take all action necessary to bring the Contractor into full compliance with the requirements of this Article, or if full compliance is no longer possible because the default of the Contractor is no longer susceptible to cure, if the Contractor fails to take such other action as may be required by the Awarding Authority to meet the M/WBE participation goals set forth in this Contract:

(1) the Awarding Authority may terminate this Contract, and/or

(2) the Awarding Authority may retain from final payment to the Contractor, as liquidated damages, an amount equal to the difference between (x) the total of the M/WBE participation goals set forth in this Contract, and (y) the amount of M/WBE
participation credit earned by the Contractor for M/WBE Work performed under this Contract as determined by the Awarding Authority, the parties agreeing that the damages for failure to meet the M/WBE participation goals are difficult to determine and that the foregoing amount to be retained by the Awarding Authority represents the parties’ best estimate of such damages. Any liquidated damages will be assessed separately for MBE and WBE participation.

B. Before exercising its rights and remedies hereunder, the Awarding Authority may, but the Awarding Authority shall not be obligated to, give the Contractor and any other interested party another opportunity to present evidence to the Awarding Authority that the Contractor is in compliance with the requirements of this Article or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The Awarding Authority may invite SOMWBA and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken hereunder.

10. Reporting Requirements.
The Contractor shall submit to the Awarding Authority all information or documentation that is necessary in the judgment of the Awarding Authority to ascertain whether or not the Contractor has complied with any of the provisions of this Article.

11. Awarding Authority’s Right to Waive Provisions of this Article in Whole or In Part.
The Awarding Authority reserves the right to waive any provision or requirement of this Article if the Awarding Authority determines that such waiver is justified and in the public interest. No such waiver shall be effective unless in writing and signed by a representative of the Awarding Authority's Compliance/Procurement Office or the office of its General Counsel. No other action or inaction by the Awarding Authority shall be construed as a waiver of any provision of this Article.
APPENDIX C to the General Conditions of the Contract

INDEX OF COMMONLY-USED FORMS

(Forms used during bidding are located in Attachment B to the Instructions to Bidders)

Procedure for Payment to Contractors
Daily Time and Material Report for Change Orders
Notice of Intent
Request and Agreement for a Change in the Plans,
   Specifications and/or Contract (UMA Form 5)
Instructions Regarding Change Orders and Contract Modifications (UMA Form 13)
Contractor’s Weekly Workforce Report
Minorities/Women in Contractor’s Weekly Workforce Report
Weekly Payroll Report Form and Statement of Compliance
Quarterly Projected Workforce Table
Certification of Payment by Contractor to MBE/WBE and Instructions
Certificate of Completion by Minority/Women Business Enterprise
Form for Transfer of Title (Work Not Incorporated, UMA Form 16)
Certificate of Agency Use and Occupancy -E-1
Certificate of Final Inspection, Release and Acceptance - E-2
Form ST-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 stagger the receipt of invoices in the University of Massachusetts Amherst
office and expedites processing contractor payments. All invoices must include:

1. The Contractor’s Name
2. The UMA Contract Number
3. The UMA Project Number
4. The Project Name
5. The Purchase Order Number
6. Must clearly state that the invoice/requisition is exactly that, not a statement
7. Invoice Number or Requisition Number
8. Invoice Date
9. Period for which the work was completed
10. Schedule of Values
11. Approved Original Signatures
12. Notary
The General Contractor and his sub-contractors, the Designer and the Resident Engineer(s) and University of Massachusetts Amherst Project Manager(s) shall approve prior to the date of submission for each periodic payment request as to the percentage value of work completed.

All questions as to the value of the work performed and as to payment for materials not incorporated into the work should be resolved in advance of the submission of the formal request for periodic payment. It is suggested that a job meeting/conference is the most effective way of resolving any questions of matters of dispute. The General Contractor shall submit to the Resident Engineer (or in the absence of a Resident Engineer, the University of Massachusetts Amherst – Project Manager (PM)) for the Resident Engineer’s approval, well in advance of the submission of the first periodic estimate, a breakdown of the various items of work corresponding to the sections of the specification making up the lump sum for item 1, Work of the General Contractor; and each section under Item 2, Sub-bids, of the contract. In addition, the General Contractor; and each sub-contractor shall furnish the Resident Engineer with two (2) copies of any necessary sub-breakdowns of each section and such other detailed information as required by the Resident Engineer to evaluate properly the percentage of the work performed. The Resident Engineer shall submit one copy to the Division, as approved by the Resident Engineer upon request.

The General Contractor shall prepare its formal request for periodic payment on the standard AIA form G702-1992, Application and Certificate for payment or other periodic payment form approved by the Awarding Authority.

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

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

IV. CERTIFICATION
The General Contractor shall sign all copies of the invoice/requisition and present same to the University of Massachusetts Amherst Project Manager certifying the value of the work performed. In the event of any dispute as to the formal request for periodic payment, the Resident Engineer and/or the Designer shall in the absence of their certification on the AIA form attach to each copy a qualified certification and a recommendation as to the dollar value of the item or items in dispute to be retained by Awarding Authority in accordance with Chapter 30, Section 39K. In the signatory space write “See attached Letter”. Neither the Resident Engineer nor the Designer shall alter the AIA Form submitted with the formal request for payment in any manner. If the Division concurs with the Engineer and/or Designer’s recommendation, adjustment(s) shall be made to the AIA form by the Division. Attention of the General Contractor is directed to the statement to the effect that payments to all sub-contractors have been made in accordance with the provision of M.G.L. c. 30, s39F which statement must be signed under penalty of perjury on each copy by the General Contractor.
V. PROCESSING FOR PERIODIC PAYMENTS

It shall be the sole responsibility of the General Contractor to choose the delivery of the request for periodic payment in proper form and arithmetically correct to the Resident Engineer (the designee provided in M.G.L., c. 30, s 39K). In the event there is no Resident Engineer assigned to the contract the Designer shall be the designee. If there be neither a Resident Engineer nor a Designer, the designee shall be the University of Massachusetts Amherst Project Manager or alternatively the home office of the Division of Facilities Planning, University of Massachusetts Amherst, Physical Plant Building, 360 Campus Center Way, Amherst, MA 01003. Payment shall be due and payable within thirty (30) days after receipt by the designee. Request for periodic payment not in the required form containing arithmetical computations which are not correct will within seven (7) days be returned to the contractor and the prescribed period for payment shall commence upon the date which the corrected periodic estimate is received at the University of Massachusetts Amherst, Division of Facilities Planning. Attention is directed to the provision of M.G.L. c. 30, s. 39K which provides that the awarding authority may make changes in any periodic estimate submitted by the contractor.

VI. INQUIRY AS TO PERIODIC REQUESTS FOR PAYMENT – PAYMENT FLOW

All inquiries as to the value of the work performed, certified and due to the General Contractor, its Sub-Contractors and suppliers shall be directed to the Resident Engineer or University of Massachusetts Amherst Project Manager.

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

VII. SPECIAL INSTRUCTION TO EMPLOYEES, PROJECT MANAGERS, RESIDENT ENGINEERS & DESIGNERS

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

UMA Project Number: ____________ Project Number: ____________ Date: ____________

Project Title: ____________________________

Contractor: ______________________________ Change Order No.: _________________

Or work under protest: ____________

Sheet _____ of ________________

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

If Yes, list on Daily Progress Report.

Labor – Change Order or Alleged Extra Work Done Under Protest

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Submitted by Superintendent: ________________________________________________

Subcontractors:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

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

Resident Engineer/ University of Massachusetts Project Manager ______________________________

The signature of the Resident Engineer/Project Manager is for verification of labor listed above and does not constitute acknowledgement that such labor is for extra work or that additional monies are due for such work.

1. Materials Used (Describe fully)
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

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

Submitted by Superintendent: ________________________________________________

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Subcontractors:

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

Resident Engineer/ University of Massachusetts Amherst Project Manager _______________________________

The signature of the Resident Engineer/Project Manager is for verification of materials listed above and does not constitute acknowledgement that such material is for extra work or that additional monies are due for such work.

Send one copy with Daily Report Each Day

Other copy to accompany Green Sheets to Designer when Change Order is completed
University of Massachusetts Amherst, Facilities Planning

Contract Modification/Authorization to Proceed

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

Date: ________________

UMA Number: ____________________ Project Number: ____________________

Project Name: ____________________________________________________________

Contractor: ________________ Contract Start Date: ___________ Contract Award: $______________

NOI Request No. ______________ Change Order No: ______________ Requestor: ______________

Nature of Request:

G.C. PCO No. ______________

Date: ______________________

Reason for Request:

Designer’s CCR No. ______________

Date: ______________________

This change in work is to be performed according to ARTICLE VII of the General Conditions of the Contract. Change Orders will be in accordance with the contract and Form 13:

_____ Predetermined "LUMP SUM" total: $_______________.00

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____ (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

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 breakdown for above in accordance with change order instructions. A claim for work performed under protest shall be submitted per (c) above.

An extension of contract time of ________________ calendar days is requested.

Contractor ___________________________ by ___________________________

Firm Name ___________________________ Authorized Signature ___________________________ Date ___________________________

III. APPROVAL RECOMMENDED BY:

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

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<th>Resident Engineer</th>
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<td>Project Manager</td>
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<td>Deputy Director</td>
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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.

Designer ___________________________ Date ___________________________

Do Not Fill in This Block

Contract Award $ ___________________________
Previous Addition $ ___________________________
Previous Net Total $ ___________________________
This Change $ ___________________________
Total To Date $ ___________________________

Contract Completion Date

Extended to ____________ Date ___________________________

If applicable to Phase ____________ of Contract

Office Change Order Approval # ___________________________

DCAM FORM #5
4/10/02

OFFICE COPY _____ COMPTROLLER _____ PROJECT ENGINEER _____ DESIGNER _____
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 DIRECTION 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>
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<th>Contract Price</th>
<th>Rates per Thousand</th>
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<tr>
<td>a) Contracts up to $500,000</td>
<td>$14.40</td>
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<tr>
<td>b) $500,000 to $2,500,000</td>
<td>$ 8.70</td>
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<td>c) $2,500,000 to $5,000,000</td>
<td>$ 6.90</td>
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<td>d) $5,000,000 to $7,000,000</td>
<td>$ 6.30</td>
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<tr>
<td>e) $7,500,000 and up</td>
<td>$ 5.76</td>
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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 ____________

Date
<table>
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<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>
<th>% of Workforce Hours To Date</th>
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**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
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. _____________________

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<thead>
<tr>
<th>JOB CATEGORY</th>
<th>NAME OF EMPLOYEE</th>
<th>MINORITY GROUP</th>
<th>GENDER</th>
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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) Total Wage (prev. wage)</th>
<th>(G) Weekly Total Amount</th>
</tr>
</thead>
</table>

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

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

The undersigned states under the pains & penalties of perjury that the above provided and attached information is a true and accurate record of each person employed on the project and the hours worked and wages paid to each such employee, including payments to the referenced benefits. M.G.L. c. 149 §27B.

Authorized signature _________________________________________________

Print Name ___________________________ Print Title ___________________________

Mail to: University of Massachusetts Amherst

Procurement Manager/Administrative Services

Physical Plant Building

360 Campus Center Way

Amherst, MA 01003

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

Prevailing Wage Rates  

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

Awarding Authority: University of Massachusetts Amherst  
Contract Number: UMA17-10  
City/Town: AMHERST  
Description of Work: Morrill I and IV North 1st and 3rd floor Microbiology Consolidation  
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 sent to all contractors bidding on 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 the 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  

Issue Date: 04/03/2017  
Wage Request Number: 20170403-048
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<th>Classification</th>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
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Issue Date: 04/03/2017  Wage Request Number: 20170403-048  Page 2 of 29
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**Notes:**
- Apprentice to Journeyworker Ratio: 1:5

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### BRICK/PLASTER/CEMENT MASON - Local 3 Springfield/Pittsfield

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**Effective Date - 02/27/2017**

Notes:

- Apprentice to Journeyworker Ratio: 1:5

For apprentice rates see "Apprentice- OPERATING ENGINEERS"
### Apprentice - CARPENTER - Local 108 Hampden Hampshire Franklin

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

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**Notes:**

**1: 1-5/2: 6-8/3:9-11/Steps: 6 mos (600 hrs)/rates by step**

### Apprentice to Journeyworker Ratio:

CEMENT MASONRY/PLASTERING

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</tr>
<tr>
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<td>06/01/2019</td>
<td>50%</td>
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<tr>
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<td>$0.00</td>
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</table>

### Notes:
- Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.
- Apprentice to Journeyworker Ratio: 1:3

For apprentice rates see "Apprentice- LABORER"

For apprentice rates see "Apprentice- OPERATING ENGINEERS"
### Apprentice - PAINTER Local 35 - BRIDGES/TANKS

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

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<th>Pension</th>
<th>Supplemental</th>
<th>Total Rate</th>
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**Notes:**
- Steps are 750 hrs.
- Apprentice to Journeyworker Ratio: 1:1

For apprentice rates see "Apprentice- LABORER*"
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<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
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<td>$65.00</td>
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For apprentice rates see "Apprentice- LABORER"

| DEMO: JACKHAMMER OPERATOR              | 12/01/2016     | $37.25    | $7.60  | $14.15  | $0.00                     | $59.00     |
| LABORERS - ZONE 3 (BUILDING & SITE)    | 06/01/2017     | $38.25    | $7.60  | $14.15  | $0.00                     | $60.00     |
|                                        | 12/01/2017     | $39.10    | $7.60  | $14.15  | $0.00                     | $60.85     |
|                                        | 06/01/2018     | $40.05    | $7.60  | $14.15  | $0.00                     | $61.80     |
|                                        | 12/01/2018     | $41.00    | $7.60  | $14.15  | $0.00                     | $62.75     |
|                                        | 06/01/2019     | $42.00    | $7.60  | $14.15  | $0.00                     | $63.75     |
|                                        | 12/01/2019     | $43.00    | $7.60  | $14.15  | $0.00                     | $64.75     |

For apprentice rates see "Apprentice- LABORER"

| DEMO: WRECKING LABORER                 | 12/01/2016     | $36.50    | $7.60  | $14.15  | $0.00                     | $58.25     |
| LABORERS - ZONE 3 (BUILDING & SITE)    | 06/01/2017     | $37.50    | $7.60  | $14.15  | $0.00                     | $59.25     |
|                                        | 12/01/2017     | $38.35    | $7.60  | $14.15  | $0.00                     | $60.10     |
|                                        | 06/01/2018     | $39.30    | $7.60  | $14.15  | $0.00                     | $61.05     |
|                                        | 12/01/2018     | $40.25    | $7.60  | $14.15  | $0.00                     | $62.00     |
|                                        | 06/01/2019     | $41.25    | $7.60  | $14.15  | $0.00                     | $63.00     |
|                                        | 12/01/2019     | $42.25    | $7.60  | $14.15  | $0.00                     | $64.00     |

For apprentice rates see "Apprentice- LABORER"

| DIVER                                  | 08/01/2015     | $60.34    | $9.80  | $18.17  | $0.00                     | $88.31     |
| PILE DRIVER LOCAL 56 (ZONE 3)          |               |           |        |         |                           |            |

For apprentice rates see "Apprentice- PILE DRIVER"

| DIVER TENDER                           | 08/01/2015     | $43.10    | $9.80  | $18.17  | $0.00                     | $71.07     |
| PILE DRIVER LOCAL 56 (ZONE 3)          |               |           |        |         |                           |            |

For apprentice rates see "Apprentice- PILE DRIVER"

| DIVER TENDER (EFFLUENT)                | 08/01/2015     | $64.65    | $9.80  | $18.17  | $0.00                     | $92.62     |
| PILE DRIVER LOCAL 56 (ZONE 3)          |               |           |        |         |                           |            |

For apprentice rates see "Apprentice- PILE DRIVER"

| DIVER/SLURRY (EFFLUENT)                | 08/01/2015     | $90.51    | $9.80  | $18.17  | $0.00                     | $118.48    |
| PILE DRIVER LOCAL 56 (ZONE 3)          |               |           |        |         |                           |            |

For apprentice rates see "Apprentice- PILE DRIVER"

<p>| ELECTRICIAN (Including Core Drilling)  | 01/01/2017     | $39.51    | $9.35  | $10.84  | $0.00                     | $59.70     |
| ELECTRICIANS LOCAL 7                  |               |           |        |         |                           |            |</p>
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<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>
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<tr>
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<tr>
<td>Step 5 65</td>
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Notes: Pre-5/31/11 Begins at Step 3 $39.72/4$41.75/$46.38/$48.60; Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

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

ELEVATOR CONSTRUCTOR
ELEVATOR CONSTRUCTORS LOCAL 41

<table>
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<tr>
<th>Effective Date</th>
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Notes: Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio: 1:1

ELEVATOR CONSTRUCTOR HELPER
ELEVATOR CONSTRUCTORS LOCAL 41

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)
LABORERS - ZONE 3 (HEAVY & HIGHWAY)

<table>
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<tr>
<th>Effective Date</th>
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For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

FIELD ENG.INST./ROD-BLDG,SITE,HVY/HWY
OPERATING ENGINEERS LOCAL 98

<table>
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<tr>
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<th>Base Wage</th>
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<th>Pension</th>
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<th>Total Rate</th>
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<tbody>
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FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY
OPERATING ENGINEERS LOCAL 98

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<tbody>
<tr>
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FIELD ENGSURVEY CHIEF-BLDG,SITE,HVY/HWY
OPERATING ENGINEERS LOCAL 98

<table>
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<th>Pension</th>
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<th>Total Rate</th>
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FIELD ENG.INST./ROD-BLDG,SITE,HVY/HWY
OPERATING ENGINEERS LOCAL 98

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For apprentice rates see "Apprentice- ELECTRICIAN"
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Apprentice - OPERATING ENGINEERS - Local 98 Class 3

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<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
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<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
</tr>
</thead>
<tbody>
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<td>06/01/2017</td>
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<td>$12.65</td>
<td>$0.00</td>
<td>$53.61</td>
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</table>

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

Apprentice to Journeyworker Ratio: 1:6

Flagger & Signaler (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>
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For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Floorcoverer

FLOORCOVERERS LOCAL 2168 ZONE III

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
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</thead>
<tbody>
<tr>
<td>03/01/2016</td>
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<td>$0.00</td>
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## FLOOR COVERER - Local 2168 Zone III

**Effective Date:** 03/01/2016

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

### FORK LIFT

**OPERATING ENGINEERS LOCAL 98**

- **12/01/2016:** $33.37, $10.58, $12.38, $0.00, $56.33
- **06/01/2017:** $33.98, $10.58, $12.65, $0.00, $57.21
- **12/01/2017:** $34.58, $10.58, $12.92, $0.00, $58.08
- **06/01/2018:** $35.19, $10.58, $13.19, $0.00, $58.96
- **12/01/2018:** $35.79, $10.58, $13.46, $0.00, $59.83
- **06/01/2019:** $36.30, $10.58, $13.73, $0.00, $60.61
- **12/01/2019:** $36.90, $10.58, $14.00, $0.00, $61.48

For apprentice rates see "Apprentice - OPERATING ENGINEERS"

### GENERATORS/LIGHTING PLANTS

**OPERATING ENGINEERS LOCAL 98**

- **12/01/2016:** $29.92, $10.58, $12.38, $0.00, $52.88
- **06/01/2017:** $30.53, $10.58, $12.65, $0.00, $53.76
- **12/01/2017:** $31.13, $10.58, $12.92, $0.00, $54.63
- **06/01/2018:** $31.74, $10.58, $13.19, $0.00, $55.51
- **12/01/2018:** $32.34, $10.58, $13.46, $0.00, $56.38
- **06/01/2019:** $32.85, $10.58, $13.73, $0.00, $57.16
- **12/01/2019:** $33.45, $10.58, $14.00, $0.00, $58.03

For apprentice rates see "Apprentice - OPERATING ENGINEERS"

### GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)

**GLAZIERS LOCAL 1333**

- **06/01/2016:** $35.58, $10.70, $8.25, $0.00, $54.53
### GLAZIER - Local 1333

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

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### Notes:

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

- **GRADER/TRENCHING MACHINE/DERRICK**
  - OPERATING ENGINEERS LOCAL 98
    - Effective Date: 12/01/2016
      - Base Wage: $33.68
      - Health: $10.58
      - Pension: $12.38
      - Supplemental Unemployment: $0.00
      - Total Rate: $56.64
    - Effective Date: 06/01/2017
      - Base Wage: $34.29
      - Health: $10.58
      - Pension: $12.65
      - Supplemental Unemployment: $0.00
      - Total Rate: $57.52
    - Effective Date: 12/01/2017
      - Base Wage: $34.89
      - Health: $10.58
      - Pension: $12.92
      - Supplemental Unemployment: $0.00
      - Total Rate: $58.39
    - Effective Date: 06/01/2018
      - Base Wage: $35.50
      - Health: $10.58
      - Pension: $13.19
      - Supplemental Unemployment: $0.00
      - Total Rate: $59.27
    - Effective Date: 12/01/2018
      - Base Wage: $36.10
      - Health: $10.58
      - Pension: $13.46
      - Supplemental Unemployment: $0.00
      - Total Rate: $60.14
    - Effective Date: 06/01/2019
      - Base Wage: $36.61
      - Health: $10.58
      - Pension: $13.73
      - Supplemental Unemployment: $0.00
      - Total Rate: $60.92
    - Effective Date: 12/01/2019
      - Base Wage: $37.21
      - Health: $10.58
      - Pension: $14.00
      - Supplemental Unemployment: $0.00
      - Total Rate: $61.79

  - For apprentice rates see "Apprentice- OPERATING ENGINEERS"

- **HVAC (DUCTWORK)**
  - SHEETMETAL WORKERS LOCAL 63
    - Effective Date: 01/01/2017
      - Base Wage: $32.24
      - Health: $10.64
      - Pension: $15.49
      - Supplemental Unemployment: $1.75
      - Total Rate: $60.12

  - For apprentice rates see "Apprentice- SHEET METAL WORKER"

- **HVAC (ELECTRICAL CONTROLS)**
  - ELECTRICIANS LOCAL 7
    - Effective Date: 01/01/2017
      - Base Wage: $39.51
      - Health: $9.35
      - Pension: $10.84
      - Supplemental Unemployment: $0.00
      - Total Rate: $59.70

  - For apprentice rates see "Apprentice- ELECTRICIAN"

- **HVAC (TESTING AND BALANCING - AIR)**
  - SHEETMETAL WORKERS LOCAL 63
    - Effective Date: 01/01/2017
      - Base Wage: $32.24
      - Health: $10.64
      - Pension: $15.49
      - Supplemental Unemployment: $1.75
      - Total Rate: $60.12

  - For apprentice rates see "Apprentice- SHEET METAL WORKER"

- **HVAC (TESTING AND BALANCING -WATER)**
  - PLUMBERS & PIPEFITTERS LOCAL 104
    - Effective Date: 03/17/2017
      - Base Wage: $39.26
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $63.06
    - Effective Date: 09/17/2017
      - Base Wage: $40.01
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $63.81
    - Effective Date: 03/17/2018
      - Base Wage: $40.76
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $64.66
    - Effective Date: 09/17/2018
      - Base Wage: $41.51
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $65.31
    - Effective Date: 03/17/2019
      - Base Wage: $42.26
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $66.06

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

- **HVAC MECHANIC**
  - PLUMBERS & PIPEFITTERS LOCAL 104
    - Effective Date: 03/17/2017
      - Base Wage: $39.26
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $63.06
    - Effective Date: 09/17/2017
      - Base Wage: $40.01
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $63.81
    - Effective Date: 03/17/2018
      - Base Wage: $40.76
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $64.66
    - Effective Date: 09/17/2018
      - Base Wage: $41.51
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $65.31
    - Effective Date: 03/17/2019
      - Base Wage: $42.26
      - Health: $8.50
      - Pension: $15.30
      - Supplemental Unemployment: $0.00
      - Total Rate: $66.06

  - For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"
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**Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Springfield**

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

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**Notes:**
- Steps are 1 year

Apprentice to Journeyworker Ratio: 1:4

**IRONWORKER/WELDER**

IRONWORKERS LOCAL 7 (SPRINGFIELD AREA)

| Effective Date - | 03/16/2017 | $32.39 | $7.80 | $19.60 | $0.00 | $59.79 |

**Apprentice - IRONWORKER - Local 7 Springfield**

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

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

Apprentice to Journeyworker Ratio:

**JACKHAMMER & PAVING BREAKER OPERATOR**

LABORERS - ZONE 3 (BUILDING & SITE)

| Effective Date - | 12/05/2016 | $29.83 | $7.60 | $12.50 | $0.00 | $49.93 |

**Issue Date:** 04/03/2017  **Wage Request Number:** 20170403-048  **Page 13 of 29**
## LABORER

LABORERS - ZONE 3 (BUILDING & SITE)


### Effective Date - 12/05/2016

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### Notes:

Apprentice to Journeyworker Ratio: 1:5

### LABORER (HEAVY & HIGHWAY)

LABORERS - ZONE 3 (HEAVY & HIGHWAY)


### Effective Date - 12/01/2016

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### Notes:

Apprentice to Journeyworker Ratio: 1:5

### LABORER: CARPENTER TENDER

LABORERS - ZONE 3 (BUILDING & SITE)


### Effective Date - 12/05/2016

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

### LABORER: CEMENT FINISHER TENDER

LABORERS - ZONE 3 (BUILDING & SITE)


### Effective Date - 12/05/2016

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

### LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER

LABORERS - ZONE 3 (BUILDING & SITE)


### Effective Date - 12/05/2015

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

### LABORER: MASON TENDER

LABORERS - ZONE 3 (BUILDING & SITE)


### Effective Date - 12/05/2016

<table>
<thead>
<tr>
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<th>Base Wage</th>
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### For apprentice rates see "Apprentice- LABORER"

### LABORER: MASON TENDER (HEAVY & HIGHWAY)

LABORERS - ZONE 3 (HEAVY & HIGHWAY)


### Effective Date - 12/01/2016

<table>
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<tr>
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### For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

### LABORER: MULTI-TRADE TENDER

LABORERS - ZONE 3 (BUILDING & SITE)


### Effective Date - 12/05/2016

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### For apprentice rates see "Apprentice- LABORER"
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<td>MARBLE &amp; TILE FINISHERS</td>
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### Apprentice - MARBLE-TILE-TERRAZZO FINISHER-Local 3 Marble/Tile (Spr/Pitt)

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

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<th>Step</th>
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**Notes:**

Apprentice to Journeyworker Ratio: 1:5

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

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

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**Notes:**

Apprentice to Journeyworker Ratio: 1:5
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

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<th>percent</th>
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Notes:
- Steps are 2,000 hours
- Apprentice to Journeyworker Ratio: 1:5

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For apprentice rates see "Apprentice- LABORER"
### OILER

**OPERATING ENGINEERS LOCAL 98**

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<th>Health</th>
<th>Pension</th>
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

### OTHER POWER DRIVEN EQUIPMENT - CLASS VI

**OPERATING ENGINEERS LOCAL 98**

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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

### PAINTER (BRIDGES/TANKS)

**PAINTERS LOCAL 35 - ZONE 3**

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

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Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio: 1:1

**PAINTER (SPRAY OR SANDBLAST, NEW)**

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*If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*

PAINTER LOCAL 35 - ZONE 3
### Apprentice - PAINTER Local 35 Zone 3 - Spray/Sandblast - New

**Effective Date:** 01/01/2017  
**Apprentice to Journeyworker Ratio:** 1:1

<table>
<thead>
<tr>
<th>Step</th>
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<th>Health</th>
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**Notes:**  
Steps are 750 hrs.

### Apprentice - PAINTER Local 35 Zone 3 - Spray/Sandblast - Repaint

**Effective Date:** 01/01/2017  
**Apprentice to Journeyworker Ratio:** 1:1

<table>
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<tr>
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**Notes:**  
Steps are 750 hrs.

### PAINTER / TAPER (BRUSH, NEW) *

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

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

<table>
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<tr>
<th>Step</th>
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**Notes:**
- Steps are 750 hrs.
- Apprentice to Journeyworker Ratio: 1:1

### Apprentice - PAINTER Local 35 Zone 3 - BRUSH REPAINT

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

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

### PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)

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

<table>
<thead>
<tr>
<th>Labour</th>
<th>Base Wage</th>
<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
<th>Total Rate</th>
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<tbody>
<tr>
<td>LABORER - ZONE 3 (HEAVY &amp; HIGHWAY)</td>
<td>$29.50</td>
<td>$7.60</td>
<td>$10.62</td>
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For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

### PANEL & PICKUP TRUCKS DRIVER

**Effective Date:** 12/01/2012

<table>
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<tr>
<th>Labour</th>
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<th>Pension</th>
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<td>$0.00</td>
<td>$47.35</td>
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### PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)

**Effective Date:** 08/31/2015

<table>
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<tr>
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<th>Pension</th>
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For apprentice rates see "Apprentice- PILE DRIVER"

### PILE DRIVER

**Effective Date:** 08/31/2015

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<th>Labour</th>
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<th>Health</th>
<th>Pension</th>
<th>Supplemental Unemployment</th>
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<tbody>
<tr>
<td>PILE DRIVER LOCAL 56 (ZONE 3)</td>
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<td>$9.80</td>
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**Issue Date:** 04/03/2017  
**Wage Request Number:** 20170403-048
### Apprentice - PILE DRIVER - Local 56 Zone 3

**Effective Date:** 08/31/2015

<table>
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<tr>
<th>Step</th>
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**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

---

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

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

<table>
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<th>Base Wage</th>
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For apprentice rates see "Apprentice - LABORER"

---

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

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

<table>
<thead>
<tr>
<th>Date</th>
<th>Base Wage</th>
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For apprentice rates see "Apprentice - LABORER (Heavy and Highway)"

---

### PLUMBER & PIPEFITTER PLUMBERS & PIPEFITTERS LOCAL 104

**Effective Date:** 03/17/2017

<table>
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<tr>
<th>Date</th>
<th>Base Wage</th>
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### Classification

#### Apprentice - PLUMBER/PIPEFITTER - Local 104

**Effective Date** - 03/17/2017

<table>
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<th>percent</th>
<th>Apprentice Base Wage</th>
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**Notes:** **1:1,2:5,3:9,4:12

Apprentice to Journeyworker Ratio:**

- **PNEUMATIC CONTROLS (TEMP.)**
  - **PLUMBERS & PIPEFITTERS LOCAL 104**
    - **Effective Date** - 03/17/2017
    - Total Rate: $63.06
    - Total Rate: $63.81
    - Total Rate: $64.56
    - Total Rate: $66.06

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

- **PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY)**
  - **LABORERS - ZONE 3 (HEAVY & HIGHWAY)**
    - **Effective Date** - 12/01/2016
    - Total Rate: $47.97

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

- **POWDERMAN & BLASTER**
  - **LABORERS - ZONE 3 (BUILDING & SITE)**
    - **Effective Date** - 12/05/2016
    - Total Rate: $50.68

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

- **POWDERMAN & BLASTER**
  - **LABORERS - ZONE 3 (HEAVY & HIGHWAY)**
    - **Effective Date** - 12/01/2016
    - Total Rate: $48.72

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"
<table>
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<tr>
<th>Classification</th>
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<th>Base Wage</th>
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For apprentice rates see "Apprentice- OPERATING ENGINEERS"

| PUMP OPERATOR (DEWATERING, OTHER)                   | 12/01/2016     | $33.15    | $10.58 | $12.38  | $0.00        | $56.11     |
| OPERATING ENGINEERS LOCAL 98                        | 06/01/2017     | $33.76    | $10.58 | $12.65  | $0.00        | $56.99     |
|                                                     | 12/01/2017     | $34.36    | $10.58 | $12.92  | $0.00        | $57.86     |
|                                                     | 06/01/2018     | $34.97    | $10.58 | $13.19  | $0.00        | $58.74     |
|                                                     | 12/01/2018     | $35.57    | $10.58 | $13.46  | $0.00        | $59.61     |
|                                                     | 06/01/2019     | $36.08    | $10.58 | $13.73  | $0.00        | $60.39     |
|                                                     | 12/01/2019     | $36.68    | $10.58 | $14.00  | $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     |
| TEAMSTERS LOCAL 404                                |               |           |        |        |              |            |

| RESIDENTIAL WOOD FRAME CARPENTER **                | 04/01/2017     | $22.08    | $7.07  | $7.18   | $0.00        | $36.33     |
| ** 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.** | 10/01/2017     | $22.63    | $7.07  | $7.18   | $0.00        | $36.88     |
| CARPENTERS LOCAL 108 - HAMPDEN HAMPSHIRE FRANKLIN | 04/01/2018     | $23.01    | $7.07  | $7.18   | $0.00        | $37.26     |
|                                                     | 10/01/2018     | $23.39    | $7.07  | $7.18   | $0.00        | $37.64     |
|                                                     | 04/01/2019     | $23.78    | $7.07  | $7.18   | $0.00        | $38.03     |
|                                                     | 10/01/2019     | $24.17    | $7.07  | $7.18   | $0.00        | $38.42     |

As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.
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**Notes:**
** 1: 1-5, 2: 6-8, 3: 9-11

**Apprentice to Journeyworker Ratio:**

**RIDE-ON MOTORIZED BUGGY OPERATOR**
*LABORERS - ZONE 3 (BUILDING & SITE)*
*For apprentice rates see "Apprentice- LABORER"*

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**ROLLER OPERATOR**
*OPERATING ENGINEERS LOCAL 98*
*For apprentice rates see "Apprentice- OPERATING ENGINEERS"*

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**ROOFER (Coal tar pitch)**
*ROOFERS LOCAL 248*
*For apprentice rates see "Apprentice- ROOFER"*

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**ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)**
*ROOFERS LOCAL 248*

| Effective Date | $31.75 | $9.41 | $12.75 | $0.00 | $53.91 |
### ROOFER - Local 248

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**Notes:**
- Steps are 750 hrs. Roofer (Tear Off) 1:1; Same as above
- Apprentice to Journeyworker Ratio: 1:3

For apprentice rates see "Apprentice - ROOFER"

### ROOFER SLATE / TILE / PRECAST CONCRETE

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For apprentice rates see "Apprentice - ROOFER"

### SCRAPER

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For apprentice rates see "Apprentice - OPERATING ENGINEERS"

### SELF-POWERED ROLLERS AND COMPACTORS (TAMPERS)

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For apprentice rates see "Apprentice - OPERATING ENGINEERS"

### SELF-PROPELLED POWER BROOM

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For apprentice rates see "Apprentice - OPERATING ENGINEERS"

### SHEETMETAL WORKER

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For apprentice rates see "Apprentice - SHEETMETAL WORKERS LOCAL 63"
### Sheet Metal Worker - Local 63

**Apprentice - ** SHEET METAL WORKER - Local 63  
**Effective Date - ** 01/01/2017

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

### Sign Erector - Local 35 Zone 3

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

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**Notes:**  
Steps are 4 mos.  
Apprentice to Journeyworker Ratio: 1:1

### Specialized Earth Moving Equip < 35 Tons

**Specialized Earth Moving Equip < 35 Tons - Teamsters Joint Council No. 10 Zone B**  
**Effective Date - ** 12/01/2016  
**Issue Date: ** 04/03/2017  
**Wage Request Number: ** 20170403-048

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### Specialized Earth Moving Equip > 35 Tons

**Specialized Earth Moving Equip > 35 Tons - Teamsters Joint Council No. 10 Zone B**  
**Effective Date - ** 12/01/2016  
**Issue Date: ** 04/03/2017  
**Wage Request Number: ** 20170403-048

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## SPRINKLER FITTER - Local 669

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### Apprentice - SPRINKLER FITTER - Local 669

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### Notes:

- Apprentices to Journeyworker Ratio: 1:1

## TELECOMMUNICATION TECHNICIAN

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### Issue Date: 04/03/2017

### Wage Request Number: 20170403-048

### Page: 26 of 29
### Telecommunication Technician - Local 7

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

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

### Terrazzo Finishers

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

| Apprentice - Terrazzo Finisher - Local 3 Marble/Tile (Spr/Pitt) | 02/27/2017 | $32.67 | $10.75 | $17.05 | $0.00 | $60.47 |

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

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

### Test Boring Driller

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

| Test Boring Driller | 12/01/2016 | $37.70 | $7.60  | $14.35 | $0.00 | $59.65 |

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

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

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

### Test Boring Driller Helper

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

| Test Boring Driller Helper | 12/01/2016 | $36.42 | $7.60  | $14.35 | $0.00 | $58.37 |

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

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

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

### Test Boring Laborer

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

| Test Boring Laborer | 12/01/2016 | $36.30 | $7.60  | $14.35 | $0.00 | $58.25 |

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

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

### Tractors

**Effective Date:** 04/03/2017

| Tractors | 04/03/2017 | $55.50 | $56.38 |

**Effective Date:** 04/03/2017

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<td>$0.00</td>
<td>$63.81</td>
</tr>
<tr>
<td>PLUMBERS &amp; PIPEFITTERS LOCAL 104</td>
<td>03/17/2018</td>
<td>$40.76</td>
<td>$8.50</td>
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<td>$64.56</td>
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<td>PLUMBERS &amp; PIPEFITTERS LOCAL 104</td>
<td>09/17/2018</td>
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<td>$65.31</td>
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<td>PLUMBERS &amp; PIPEFITTERS LOCAL 104</td>
<td>03/17/2019</td>
<td>$42.26</td>
<td>$8.50</td>
<td>$15.30</td>
<td>$0.00</td>
<td>$66.06</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>
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</tr>
<tr>
<td>Outside Electrical - West</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EQUIPMENT OPERATOR</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>GROUNDMAN</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>
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<td>OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42</td>
<td></td>
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</tr>
<tr>
<td>GROUNDMAN / TRUCK DRIVER</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>
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<tr>
<td>HEAVY EQUIPMENT OPERATOR</td>
<td>08/30/2015</td>
<td>$44.37</td>
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<td></td>
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<tr>
<td>JOURNEYMAN LINEMAN</td>
<td>08/30/2015</td>
<td>$48.80</td>
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<td>$9.46</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>
### Apprentice - LINEMAN (Outside Electrical) - West Local 42

**Effective Date:** 08/30/2015

<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>$29.28</td>
<td>$8.20</td>
<td>$0.88</td>
<td>$0.00</td>
<td>$38.36</td>
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<tr>
<td>2</td>
<td>65</td>
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<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>$0.90</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>$0.94</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>$0.92</td>
<td>$0.00</td>
<td>$61.44</td>
</tr>
</tbody>
</table>

**Notes:**

- **Apprentice to Journeyworker Ratio:** 1:2

---

**TELEDATA CABLE SPLICER**

*OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*

- **Effective Date:** 01/01/2016
- **Base Wage:** $28.98
- **Health:** $4.25
- **Pension:** $3.12
- **Total Rate:** $36.35

---

**TELEDATA LINEMAN/EQUIPMENT OPERATOR**

*OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*

- **Effective Date:** 01/01/2016
- **Base Wage:** $27.31
- **Health:** $4.25
- **Pension:** $3.07
- **Total Rate:** $34.63

---

**TELEDATA WIREMAN/INSTALLER/TECHNICIAN**

*OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*

- **Effective Date:** 01/01/2016
- **Base Wage:** $27.31
- **Health:** $4.25
- **Pension:** $3.07
- **Total Rate:** $34.63

---

**TRACTOR-TRAILER DRIVER**

*OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*

- **Effective Date:** 08/30/2015
- **Base Wage:** $42.16
- **Health:** $8.20
- **Pension:** $9.26
- **Total Rate:** $59.62

---

**TREE TRIMMER**

*OUTSIDE ELECTRICAL WORKERS - WEST LOCAL 42*

- **Effective Date:** 01/31/2016
- **Base Wage:** $18.51
- **Health:** $3.55
- **Pension:** $0.00
- **Total Rate:** $22.06

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.

---

**Notes:**

- **Apprentice to Journeyworker Ratio:** 1:2
WEEKLY PAYROLL RECORDS REPORT
& STATEMENT OF COMPLIANCE

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

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

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

Date: _____ / _____ / 20___

I, _________________________________

______________________________

(Name of signatory party) (Title)

do hereby state:

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

______________________________ on the ________________________________

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

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

Signature ________________________________

Title ________________________________
QUARTERLY PROJECTED WORKFORCE TABLE
UNIVERSITY OF MASSACHUSETTS AMHERST

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

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

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

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

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

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

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

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

Authorized Signature __________________________ Title_________________________ Date_________________________

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

Quarterly Projected Workforce Table - Revised 10/01
CERTIFICATE OF PAYMENT
BY CONTRACTOR/DESIGNER TO MINORITY & WOMEN BUSINESS ENTERPRISES
UNIVERSITY OF MASSACHUSETT AMHERST

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

Reporting
Period________________________

Physical Plant Building

Contract Date

________________________

Design Contract
Construction Contract

RE: UMA No.__________________________________________

Project No.

Project Name________________________________________

The undersigned hereby certifies under the pains and penalties of perjury that the contractor/designer named below has made the following payments to the named Minority and Women Business Enterprises for work performed on the above project:

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

193
(Contractor or Subcontractor's Name)

By: ________________________________

Title: ________________________________

hereunto duly authorized

UNIVERSITY OF MASSACHUSETTS AMHERST, ss

Then appeared the said ________________________________ to me known or proven to be the
__________________________ of ________________________________ and
acknowledged the foregoing to be his free act and deed and the free act and deed of
__________________________ ________________________________, before me.

______________________________
Notary Public

My Commission Expires: __________________

The General Contractor hereby certifies under penalties of perjury that the goods and chattels
transferred above meet the requirements of the Plans and Specifications and will shortly be
needed for the Work; that the General Contractor can and will adequately protect them in
accordance with the Contract Documents until they are incorporated in the Work; that said goods
and chattels are insured as required by the Contract Documents; that acceptance of these goods
and chattels by the University of Massachusetts Amherst shall not constitute a waiver of any
claim arising out of the construction contract between the parties, nor of any claims for breach of
warranty, express or implied, or otherwise, arising out of this sale; that it is understood that the
University of Massachusetts Amherst reserves the right to give notice of any of the aforesaid
breaches at any time subsequent to said sale when said breach first appears to the University of
Massachusetts Amherst.

In Witness whereof we, the said ________________________________ hereunto set

(Catalyst'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
AGENCY
USE AND
OCCUPANCY

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:

<table>
<thead>
<tr>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Designer</th>
<th>Authorized Signature</th>
<th>Title</th>
<th>Date</th>
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</table>

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:  $<>  
   Authorized Additions:  $<>  
   Authorized Deductions  $<>  
   Adjusted Contract Price:  $<>  
   Paid to Date:  $<>  
   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.

<table>
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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
Form ST-5C
Contractor's Sales Tax Exempt Purchase Certificate

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

Exempt number

Contract number

Name of exempt organization

University of Massachusetts

Authorizing signature

Date

Director of Procurement

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

Purchaser [ ] contractor [ ] subcontractor

Address

Date

Vendor registration number (if applicable)

Contract/subcontract number

Contract/subcontract date

Estimated date of completion

Part C. To be completed by purchasing contractor or subcontractor claiming exemption. See instructions. I claim the exemption corresponding to the box checked below, and certify as follows (check appropriate box below):

1. [ ] Exemption under MGL Ch. 64H, sec. 6(d) or (e): Contractor as Agent of Exempt Entity. I certify that the purchaser is a contractor or subcontractor engaged in the performance of a contract for the 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 described quantities of building materials and supplies noted on the reverse side are exempt from sales/use tax under the provisions of MGL Ch. 64H, sec. 6(f), and the described quantities of these materials and supplies are being purchased for use exclusively in the above contract.

3. [ ] Exemption under MGL Ch. 64H, sec. 6(tt): Consulting/Operating Contractor as Agent of Governmental Entity. I certify that the purchaser is a consulting or operating contractor or subcontractor as defined in MGL Ch. 64H, sec. 6(tt) and that the purchaser is authorized and acting as an agent of, and providing "qualified services," as defined in MGL Ch. 64H, sec. 6(tt), to a governmental body or agency described in MGL Ch. 64H, sec. 6(dd). 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 if I am fully liable for the payment of any sales/use tax due in the event that the property purchased under this certificate is used in a non-exempt manner.

Signed under the penalties of perjury.

Signature

Title

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

PART IV

SUPPLEMENTARY GENERAL CONDITIONS

AND

SPECIFICATIONS

200
THE UNIVERSITY OF MASSACHUSETTS
FACILITIES PLANNING DIVISION

SPECIFICATIONS FOR
UMA PROJECT NO. UMA 17-10
Morrill I and Morrill IV Microbiology Consolidation
And Neuroscience Development

DATE: April 2017

Stephen VanDyke, Nault Architects, Inc.
Architect-of-Record

Semoon Oh, VAV International
Mechanical Engineer

John Pierga, BLW Engineers
Electrical Engineer

END OF SEALS
UNIVERSITY OF MASSACHUSETTS  
DESIGN & CONSTRUCTION MANAGEMENT  
MGL CHAPTER 149 - DESIGN-BID-BUILD PROJECTS  

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SECTION 011000

SUMMARY

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

A. The work to be done under this contract consists of executing and completing all work required for UMA 17-10, renovations to the portions of the first and third floors of Morrill IV North and portions of the third floor of Morrill I, together with related adjacent common spaces, at the University of Massachusetts, Amherst.

1. General Information

a. The project consists of renovations to existing office and laboratory space. The project shall be designed and constructed so as to meet all requirements of the Massachusetts State Building Code, current edition, in addition to all other applicable codes and regulations.

b. Morrill 1 and Morrill IV North are part of a larger complex (Morrill Science Center) and are a connected 4 story structure, of Construction Classification IB, for Use Group B (Business). Functional building areas include a combination of research laboratories, teaching and office space. The bulk of mechanical/electrical equipment areas are located in a mechanical penthouse at the roof level, and various utility rooms on lower floors.

c. The structural system for the super-structure is concrete columns and beams with concrete floors and roof decks. The sub-structure is cast-in-place concrete foundations. The building envelope is brick veneer.
d. The base building includes (a) double-loaded corridors with acoustic ceiling tiles, painted lath-and-plaster and gypsum board walls, and VCT, VAT and resinous flooring, (b) public toilets finished with ceramic thinset tile floors, glazed ceramic tile and painted gypsum board walls, 2’ x 2’ acoustical tile ceilings, brushed stainless steel accessories, solid plastic and steel toilet partitions and urinal screens, and porcelain plumbing fixtures, (c) common circulation elements including one hydraulic passenger elevators, and three fire stairs, (d) building supervisory offices including staff and faculty offices, (e) building service elements including janitors’ closets, and associated circulation services corridors and, (f) mechanical/electrical equipment areas including air handler rooms, switchgear room, telephone service rooms, emergency distribution closets and telecommunications closets.

e. The tenant build-out space includes rooms on the third floor of Morrill I and the first and third floors of Morrill IV North, as shown on the Drawings. Collateral work to support or permit the work within these rooms will include portions of the common corridors serving the project area, and portions of the ceiling of the floors below.

f. Base building heating, cooling, and electrical systems include the following:

1) No sprinkler system is present.

2) Plumbing systems include comingled potable/non-potable water systems, dedicated lab waste and vent piping, and house purified water. Lab systems include house gas and compressed air. A dedicated acid neutralization system for lab waste and a recirculating tempered water loop has been recently installed by others, for connection of the work of this project, in advance of the start of work.

3) Mechanical systems include perimeter radiation with individual ceiling hung fan coil units in rooms and wall-mounted fan coil units in corridors. A central rooftop fume hood exhaust fan set provides fume hood exhaust to the Morrill IV North portion of the building.

4) Electrical distribution is through existing 277V in-wall transformers, serving distribution panels throughout the project area.

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

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:

SUMMARY
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1. Renovation of existing interior space to create the following new spaces:
   a. Four discreet lab suites, including wet lab space, dedicated office space and lab support rooms, within the first floor of Morrill IV North.
   b. One discreet lab suite with a dedicated office and lab support room on the third floor of Morrill IV North.
   c. Three community equipment rooms on the first floor of Morrill IV North, one of which to be used for radioactive work.
   d. A common department conference room and break room on the first floor of Morrill IV North.
   e. An IT room on the first floor of Morrill IV North.
   f. A common office on the third floor of Morrill IV North, and subject to the acceptance of alternates, up to 5 common offices on the third floor of Morrill.
   g. Collateral wall, floor and ceiling work where required on floors above or below the main project areas, as required to route and install new utilities to support the renovation scope.

2. Revisions to plumbing systems related to the lab renovations, involving potable and non-potable water services, purified water services, tempered water to emergency showers and eye wash stations, lab gas piping systems, and all lab sinks, faucets and fixtures.

3. Renovation of existing HVAC involving removing/reinstalling fan coil units, fume hood exhaust duct revisions, ductwork and piping revisions.

4. Electrical work including a new transformer, new distribution panels, power devices and wiring, new lighting, fire alarm revisions and communications cabling.

5. Asbestos-Containing Materials: The Contractor shall be made aware that asbestos-containing materials are present in the building. Any new work called for by the Drawings that will disturb asbestos-containing materials will require abatement to be performed as outlined under Section 020800 - Asbestos Abatement of the Contract. However, the Contractor shall be made aware that 100% abatement of all asbestos materials located throughout each work area will not be performed and that contact with any remaining asbestos materials should be avoided. The Contractor is hereby made aware of this requirement and shall be responsible for all costs associated with compliance with OSHA 29 CFR 1926.1101 Regulations with regards to protection of workers (as deemed necessary by each trade).

6. Light Ballast and Mercury Containing Lamps: The General Contractor shall be required to properly remove and dispose of all PCB-containing and non-PCB diethylhexl phthalate (DEHP) containing ballasts and mercury containing lamps located at the interior of the building subject to renovation activities outlined by the Drawings. All ballasts and lamps
shall be removed by properly trained personnel in accordance with local, state and federal regulations. All materials shall be properly packaged, transported and disposed of in accordance with local, state and federal regulations.

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. Work will include all site removal and new construction for project UMA 17-10, including finishes, equipment, HVAC work, plumbing work, fire protection, and electrical work as required. The General Contractor will provide a schedule for completion of the project to the Owner within the required construction period.

F. 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 job site on the date and at the time indicated in the Invitation to Bid.

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

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

D. Contact: The designer will be present at the pre bid conference. Any further questions subsequent to the submission of the bid shall be directed to: Peter Royer by email at procurement@admin.umass.edu.

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

A. The General Contractor must be currently certified by the Division of Capital Asset Management and Maintenance (DCAMM) for General Building Construction.

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

C. It is the Bidder’s responsibility to obtain the necessary forms from DCAMM and make application to DCAMM not less than three weeks prior to advertised bid opening for DCAMM to evaluate the application and issue a Certificate of Eligibility.

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

1. Contractors may perform the work in any sequence they see fit. Phasing or early return of certain spaces will not be required.

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 within the construction areas shown on the site drawing(s). Coordinate work of all Subcontractors required outside the construction area boundary shown on the site drawing(s). Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public (if applicable).

2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner’s employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

3. Areas outside the Construction Fence or Immediate Work Area: The Contractor is responsible for clean-up of all debris, dirt and sediment resulting from the construction work of this project.

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

1. The existing lab areas adjacent to the project area which are not receiving work, need to remain operational and accessible to researchers throughout the construction duration.

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

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

D. Coordinate with UMA and the Designer, work in connection with adjacent driveways, walks, or other facilities which would prevent access thereto or interrupt, restrict, or otherwise infringe upon the Operating Agency’s use thereof.

E. The General Contractor shall be aware of the sensitivity of the building occupants to noise, dust, debris, vibration, and site maintenance and take appropriate precautions to avoid conflict. **Constant hammerdrilling is not allowed and use of special drill bits is required** – coordination with UMA is necessary.

F. Damage to existing work, if caused by the General Contractor’s operations under this Contract, shall be repaired at the General Contractor’s expense.
1. An existing conditions survey shall be conducted, with the Designer, the UMA Project Manager, and UMA representatives, at which existing conditions will be videotaped by the General Contractor. A copy of the videotape will be provided to the UMA Project Manager.

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

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

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

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

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

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

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

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

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

1. Utilities Available for use During Construction: Water, heat, electricity, as available within the project areas.
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 grounds. This policy applies to everyone and anyone on campus, including students, staff, faculty, contractors and visitors. For the purpose of this policy, ‘tobacco’ refers to any and all tobacco products, whether inhaled or ingested, as well as electronic cigarettes.

1. The use of tobacco is prohibited in all buildings and vehicles owned or leased by UMASS Amherst, regardless of location.
2. The use of tobacco is prohibited on all University grounds and in any outdoor area controlled by the University. This includes all University land, parking lots and parking ramps, athletic fields, tennis courts and recreational areas.
3. The use of tobacco is prohibited inside any vehicle located on University grounds.
4. When any person enters the grounds of the University, any smoking material shall be extinguished and disposed of in an appropriate receptacle at the perimeter of the grounds of the University.

T. The Contractor shall not allow the use of intoxicating beverages or non-prescription controlled substance drugs upon or about the work site.
U. The Contractor shall provide and maintain in good serviceable condition at all times, warning signs and non-combustible barriers, forms and fire resistive tarp 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 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. This project is an interior renovation, and no field engineering is anticipated. If, however, the project scope changes such that exterior work becomes necessary, 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. Refer to Section 014200 - REFERENCES.

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

1.13 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 Filed-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. For this project, all meetings will be held on Wednesdays, at a time to be determined.

B. 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.

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. 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.

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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 perform and/or coordinate all cutting, coring, fitting and patching of the work as specified in Section 017329 – Cutting and Patching, the requirements of which govern over the requirements of this section in the event of conflict.

B. The General Contractor shall coordinate that the work of the Subcontractor is not endangered by any cutting, coring, excavating, or otherwise altering of the work and shall not allow the cutting or altering the work of any Subcontractor except with the written consent of the Designer.

C. Submit a written request to Designer at least three (3) business days in advance of executing any cutting or alteration which affects:

1. Work of UMA or separate Contractor.
2. Structural value or integrity of any element of the Project.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance, or safety of operational elements.
5. Visual qualities of sight-exposed elements.
6. Request shall include:
   a. Identification of the Project.
   b. Description of affected work.
   c. The necessity for cutting, alteration, or excavation.
   d. Effect on work of UMA or any separate General Contractor, or on structural or weatherproof integrity of Project.
   e. Description of proposed work:
   f. Alternatives to cutting and patching.
   g. Cost proposal, when applicable.
   h. Written permission of any separate General Contractor whose work will be affected.
7. Should conditions of Work or the schedule indicate a change of products from original installation, General Contractor shall submit request for substitution.
8. Submit written notice to Designer designating date and time the work will be uncovered a minimum of three business days in advance.

D. Performance:
1. Execute cutting and patching by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
   a. In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
   b. Prior to cutting and structural steel or concrete work, contact Designer and Project Structural Engineer in writing. Do not cut any structural steel and concrete work until approval has been granted by the Designer and the Project Structural Engineer.

2. Employ original installer or fabricator to perform cutting and patching for:
   a. Weather-exposed or moisture-resistant elements.
   b. Sight-exposed finished surfaces.

3. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

4. Restore work which has been cut or removed; install new products matching existing to provide completed Work in accordance with requirements of Contract Documents.

5. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

6. Patch with seams which are durable and as invisible as possible. Flash and seal all penetration of exterior work. Comply with specified tolerances for the work.

7. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.
   a. Where patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch.

8. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
   a. For continuous surfaces, refinish to nearest intersection.
   b. For an assembly, refinish entire unit.

E. Existing Utilities Services:

1. Interruptions to critical existing utility services will not be allowed except as scheduled per Section 015000 - Temporary Facilities and Controls.
   a. Sanitary sewer, storm drainage, and water changeovers as affecting existing services shall be done with no disruptions of existing services and scheduling of such work will require approval in writing by the UMA.
   b. All relocation of existing electrical, telephone, and gas services that are utility company owned shall be performed by the respective utility company, and the cost of any charges for such work shall be paid by the General Contractor. All utility installations and relocation shall be the responsibility of the General Contractor. Coordination of all of the aforesaid work is the responsibility of the General Contractor.

2. The General Contractor shall locate and record on Drawings all existing utilities along the course of the work by such means as the Designer and the UMA Project Manager may approve, and shall preserve such marked locations until the work has progressed to the point where the encountered utility is fully exposed and protected as required. It shall be the General Contractor’s responsibility to notify the proper authorities and/or utility company before interfering therewith.

3. Existing utilities that are indicated on the Drawings or whose locations are made known to the General Contractor prior to excavations, though accuracy and information as to grades and elevations may be lacking, shall be protected from damage during the
excavation and backfilling operations and, if damaged by the General Contractor, it shall be repaired by the General Contractor at his/her own expense.

4. All exposed conduits, wires, and/or cables shall be provided with sufficient protection and support to prevent failure, fraying, or damage due to backfilling or other construction operations.

5. The General Contractor shall not obstruct access to existing active utility system manholes and catch basins which continue to serve facilities other than the project construction site. The General Contractor shall exercise measures as necessary to prevent the placement of impediments that limit continuous access by authorized utility company or UMA maintenance personnel and shall be required to reimburse the utility company or UMA for any expense incurred as a result of need to remove any such impediments to access.

F. Dig-Safe:
1. If excavation, staking or any other scarifying existing grade to a depth greater than 6 inches is required, the Contractor shall follow the standard DIG-SAFE procedures as described in Massachusetts General Laws (CMMR 82:Section 40). Contractor shall review the following procedures with the UMA Project Manager prior to initiating DIG-SAFE procedures to insure that there have not been changes.

2. The Contractor shall pre-mark all areas to the full extent of proposed excavation(s) with white paint. Use 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.
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 as UMass Amherst including the project/building address and/or names of adjacent roads and or buildings.

C. Dialing 5-2121 on a campus phone or 413-545-2121 on an outside phone reaches the UMass Police (General Business). UMass Police can facilitate obtaining necessary services for the emergency.
D. Emergencies: In the event of an emergency on-site, telephone for emergency services (ambulance, fire department or police assistance)

E. Telephone for Emergency Service (See 1.20A above)

F. Call 911 or 545-2121 and inform them if confined space rescue equipment is required or if hazardous material is involved.

G. If live steam, electricity, or other utilities need to be shut off, call the U.M.A. Solution Center switchboard (545-6401) 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. Solution Center switchboard (545-6401) 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 29 CFR 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 and the General Contractor shall maintain a log of all bagging/unbagging of smoke detectors by all trades. 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. 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.

Q. 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.

R. 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.

S. 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 UMA OCCUPANCY

A. Beneficial Use and Occupancy: Refer to requirements in Section 017700 - CONTRACT CLOSEOUT, Par. 1.6.

B. Use and Occupancy: When the project is Substantially Complete (with all work affecting health, safety, and function totally completed, and with less than one percent (<1%) of the contract value remaining) and ready for Use and Occupancy as determined by the Designer, the UMA Project Manager and the Operating Agency, then the UMA will take control of their building area(s) and be responsible for operating costs and security.
1.25 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.

B. The UMA Project Manager and UMA EHS 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. The minimum contents of the Plan are specified in Section 013300 – SUBMITTAL REQUIREMENTS.

B. The General Contractor shall be solely responsible for implementing the procedures specified in the Plan.

C. The General Contractor shall make available complete sets of personal protective equipment and clothing to UMA for use during site observations/inspections by UMA and the Designer. These shall be supplied and maintained at no cost to UMA and the Designer, and shall be returned to the General Contractor upon the completion of work, except for disposable protective clothing.

1. The General Contractor shall provide a repository for collection and disposal of health and safety materials. Collection and disposal of contaminated disposable supplies shall be at no additional cost.

1.27 LIST OF DRAWINGS

T1 - COVER SHEET

ARCHITECTURAL
A1.0 - AREA OF WORK PLANS
A1.1 – DEMO AND NEW CORRIDOR ELEVATIONS
A2.0 - SUITE A DEMO PLAN
A2.1 - SUITE A NEW PLANS
A2.2 - SUITE A NEW ELEVATIONS
A3.0 - SUITE B DEMO PLAN
A3.1 - SUITE B NEW PLANS
A3.2 - SUITE B NEW ELEVATIONS
A4.0 - EQUIPMENT ROOM PLANS AND DEMO ELEVATIONS
A4.1 - EQUIPMENT ROOM NEW ELEVATIONS
A5.0 - SUITE C DEMO PLANS AND ELEVATIONS
A5.1 - SUITE C NEW PLANS AND ELEVATIONS
A5.2 - SUITE C NEW ELEVATIONS
A6.0 - LAB BENCH TYPES A & B
A6.1 - LAB BENCH TYPES C & D
A6.2 - LAB BENCH DETAILS
A6.3 - CABINET TYPES & DETAILS
A7.0 - DETAILS
A7.1 - DOOR DETAILS AND FINISH SCHEDULE
A8.0 - EXTERIOR ELEVATIONS
A9.0 - ALT 1 AND 2 - MORRILL I PLANS AND DETAILS
A9.1 - ALT 1 AND 2 - MORRILL I PLANS AND DETAILS

PLUMBING
P0.1 - PLUMBING SCHEDULES, DETAILS & LEGEND
P1.0 - BASEMENT LEVEL PLUMBING PLAN - DEMOLITION
P1.1 - FIRST FLOOR PLUMBING PLAN - DEMOLITION
P1.2 - SECOND FLOOR PLUMBING PLAN - DEMOLITION
P1.3 - THIRD FLOOR PLUMBING PLAN - DEMOLITION
P2.0 - BASEMENT LEVEL PLUMBING PLAN - NEW WORK
P2.1 - FIRST FLOOR PLUMBING PLAN - NEW WORK
P2.2 - FIRST FLOOR PLUMBING PLAN - NEW GAS PIPING
P2.3 - SECOND FLOOR PLUMBING PLAN - NEW WORK
P2.4 - THIRD FLOOR PLUMBING PLAN - NEW WORK

MECHANICAL
M0.1 - HVAC SCHEDULES & LEGEND
M0.2 - HVAC DETAILS
M0.3 - HVAC DETAILS
M1.0 – BASEMENT LEVEL HVAC PIPING PLAN – DEMOLITION
M1.1 - FIRST FLOOR HVAC DUCTWORK PLAN - DEMOLITION
M1.2 - FIRST FLOOR HVAC PIPING PLAN - DEMOLITION
M1.3 - THIRD FLOOR HVAC DUCTWORK PLAN - DEMOLITION
M1.4 - THIRD FLOOR HVAC PIPING PLAN - DEMOLITION
M2.0 – BASEMENT LEVEL HVAC PIPING PLAN – NEW WORK
M2.1 - FIRST FLOOR HVAC DUCTWORK PLAN - NEW WORK
M2.2 - FIRST FLOOR HVAC PIPING PLAN - NEW WORK
M2.3 - THIRD FLOOR HVAC DUCTWORK PLAN - NEW WORK
M2.4 - THIRD FLOOR HVAC PIPING PLAN - NEW WORK

ELECTRICAL
E0.1 - ELECTRICAL - LEGEND AND NOTES
E0.2 - ELECTRICAL - DETAILS AND SCHEDULES
E0.3 - ELECTRICAL - PANELBOARD SCHEDULES
E1.0 - ELECTRICAL - FIRST FLOOR DEMOLITION PLAN
E1.1 - ELECTRICAL - THIRD FLOOR DEMOLITION PLAN
E2.0 - ELECTRICAL - NEW LIGHTING PLAN
E2.1 - ELECTRICAL - NEW WORK LIGHTING PLAN
E3.0 - ELECTRICAL - NEW WORK POWER PLAN
E3.1 - ELECTRICAL - NEW WORK POWER PLAN
E4.0 - ELECTRICAL - NEW WORK FIRE ALARM PLAN
E4.1 - ELECTRICAL - NEW WORK FIRE ALARM PLAN

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 012300

ALTERNATES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Definition: "Alternates" are alternate products, materials, equipment, systems, methods, units of work or major elements of the construction, which may, at the Awarding Authority’s option and under the terms established by the Contract or Agreement, be selected for the work in lieu of the corresponding requirements of the Contract Documents.

B. Alternate Requirements: A Schedule of Alternates is included at the end of this Section. Each alternate is defined using abbreviated language, recognizing that the Contract Documents define the requirements. Coordinate related work to ensure that work affected by each alternate is complete and properly interfaced with work of each selected alternate.

C. Provide written proposals for each alternate on the Form of Proposal for the Awarding Authority’s consideration. Each proposal amount shall include the entire cost of the alternate portion of the work including overhead, profit, taxes, insurance, and other costs including cost of interfacing and coordinating the alternate with related and adjacent work.

D. Selection of Alternates: Selection of alternates to be included in the work will be by the Awarding Authority. Alternates must be taken in order. The first alternate before the second alternate, etc.

E. Notification: Prepare and distribute to each entity a notification of status of each alternate. Indicate which alternates have been accepted or rejected, or when such decision is anticipated.

1.3 DESCRIPTION OF ADD ALTERNATES

A. Add Alternate No. 1: Renovate Morrill I, rooms N311B and N311C as illustrated on Sheet A9.0 and A9.1

B. Add Alternate No. 2: Renovate Morrill I, room N311D as illustrated on Sheet A9.0 and A9.1
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 012300

ALTERNATES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Definition: "Alternates" are alternate products, materials, equipment, systems, methods, units of work or major elements of the construction, which may, at the Awarding Authority’s option and under the terms established by the Contract or Agreement, be selected for the work in lieu of the corresponding requirements of the Contract Documents.

B. Alternate Requirements: A Schedule of Alternates is included at the end of this Section. Each alternate is defined using abbreviated language, recognizing that the Contract Documents define the requirements. Coordinate related work to ensure that work affected by each alternate is complete and properly interfaced with work of each selected alternate.

C. Provide written proposals for each alternate on the Form of Proposal for the Awarding Authority’s consideration. Each proposal amount shall include the entire cost of the alternate portion of the work including overhead, profit, taxes, insurance, and other costs including cost of interfacing and coordinating the alternate with related and adjacent work.

D. Selection of Alternates: Selection of alternates to be included in the work will be by the Awarding Authority. Alternates must be taken in order. The first alternate before the second alternate, etc.

E. Notification: Prepare and distribute to each entity a notification of status of each alternate. Indicate which alternates have been accepted or rejected, or when such decision is anticipated.

1.3 DESCRIPTION OF ADD ALTERNATES

A. Add Alternate No. 1: Renovate Morrill I, rooms N311B and N311C as illustrated on Sheet A9.0 and A9.1

B. Add Alternate No. 2: Renovate Morrill I, room N311D as illustrated on Sheet A9.0 and A9.1
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Without limitations, coordination will include Critical Path Method Scheduling (CPM), coordination of submittals, coordination of all elements of the Work, and coordination of contract closeout.

B. Description:

1. Coordinate scheduling, submittals, and work of the various Subcontractors and elements of the Work to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.
2. Coordinate sequence of the Work to accommodate UMA Partial (Beneficial) Occupancy.

C. Meetings:

1. In addition to progress meetings, hold coordination meetings and pre-installation conferences with personnel and Subcontractors to assure coordination of the Work.

D. Coordination of Submittals:

1. Schedule and coordinate submittals.
2. Coordinate work of various Subcontractors having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
3. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other Subcontractors,

E. Mechanical and Electrical Coordinator (MEC): not required.

F. Commissioning: Not required.

G. BIM Coordination: Not required.

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 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

3. Make adequate provisions to accommodate items scheduled for later installation.

C. 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

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of 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. Pre-installation conferences.
7. Change order requests.
8. Project closeout activities

1.4 COORDINATION DRAWINGS

A. Not Required.

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 as required to allow for communication with the U.M.A. Project Manager and the U.M.A. 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 sub contractors.

1.6 PROJECT MEETINGS

A. General: Meetings will be held on Wednesdays, at the Project site, unless otherwise indicated.

1. Attendees: Participants and others involved, including sub-contractors, and individuals whose presence is required.

2. Minutes: The Architect shall record significant discussions and agreements achieved, and distribute the meeting minutes to everyone concerned. The General Contractor shall be responsible for transmitting meeting minutes to all sub-contractors, as he deems appropriate. Contractors shall review the minutes, and advise the Architect in writing, of any errors, omissions or other required changes, within 5 days of receipt. Items not contested shall stand as the official record.

B. Preconstruction Conference: A pre-construction conference shall be scheduled and chaired by the U.M.A. 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: U.M.A. 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. 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.
   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. 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.
l. Schedule lab safety training with UMA EH&S, as required by section 011000, paragraph 1.20.S, T.
m. Responsibility for temporary facilities and controls.
n. Parking and construction limits.
o. Office, work, and storage areas.
p. Equipment deliveries and priorities.
q. First aid.
r. Security.
s. Progress cleaning.
t. Working hours.
u. Emergency phone numbers.
v. Payment procedures and Schedule of Values.
w. 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 Filed-Sub Contractors.

C. Progress Meetings: Progress meetings shall be held at weekly intervals, on Wednesdays.

1. 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.

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 Filed-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.

D. Coordination Meetings: Conduct Project coordination meetings at intervals as determined by the Contractor or when requested by the U.M.A. 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 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.

   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
SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Procedures and requirements for submission and review of progress schedules and reports.

1.3 RELATED SECTIONS

A. CONTRACT AND GENERAL CONDITIONS

1. Failure to complete the Work on time - liquidated damages.

B. Section 011000 – SUMMARY

1. Project meetings.

C. Section 013100 - PROJECT MANAGEMENT AND COORDINATION

1. Progress and coordination meetings.

D. Section 013300 - SUBMITTAL REQUIREMENTS

1. Project reports.
2. Schedule of values.
3. Shop drawings, product data, and samples.

1.4 CONSTRUCTION SCHEDULE

A. General Contractor shall prepare and submit for Designer and UMA’s information, a Critical Path Method (CPM) Progress Schedule for the work of the project. Said schedule will be coordinated with the Designer’s Work Plan to include sequencing of the project work and shall be submitted within 2 weeks of pre-construction meeting.
B. In addition, the General Contractor shall prepare and submit at each project meeting, a two-week look-ahead schedule. The schedule shall identify:
   1. Major elements of the work which were complete since the last project meeting, organized by room or by trade.
   2. Major elements of the work to be performed in the next two weeks, to be able to track short-term conformance to the overall project schedule.
   3. A projection of any upcoming required service interruption notices

1.5 CRITICAL PATH METHOD SCHEDULING

A. Due to the limited size of the project and the short construction duration, full project scheduling and management through PRIMAVERA and other such software will not be required. The General Contractor remains responsible for identifying the critical path of all project activities and milestones, and will not be entitled to any additional compensation or any additional days related to Change Order work unless it can be demonstrated that latent conditions impact the critical path.

B. The critical path schedule shall be updated and resubmitted with each Application for Payment, and shall be considered a prerequisite for payment.

C. Additional Requirements

   1. Provide a list in EXCEL format and the associated database file, as prescribed by UMA, of every submittal of shop drawings, product data, samples and other submittals required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date. The list shall identify the following where applicable:

      a. Every long lead item required by the contract.
      b. Every pre-purchase item required by the contract.
      c. Every Owner-furnished item required by the contract. The list of Owner-furnished items shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will actually be required on the site.

      1) Deliveries of Owner-furnished equipment or materials shall be shown on the schedule with time windows to be provided by the Commonwealth.
      2) Neither the Designer nor the Commonwealth will be responsible for acceptance of a list that calls for out-of-sequence delivery of Owner-furnished items.
1.6 CRITICAL PATH METHOD SCHEDULER

A. A full-time, independent, project-dedicated scheduler will not be required for this project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 013300

SUBMITTAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Shop drawings, products data, samples, submittal logs (shop drawings and samples, RFI, NOI, PCO, CO and SK drawings), weather protection (if applicable) and schedule of values.

1.3 SHOP DRAWINGS, PRODUCTS DATA, AND SAMPLES

A. General:

1. Review and submit to the Designer and where outlined below to the UMA Project Manager, shop drawings, project data and samples required by Specifications Sections in hard and electronic copies.
2. Electronic submittals made in Adobe Acrobat (pdf) format by email, are preferred. No submissions made by FAX will be accepted.
3. The General Contractor, within the time frame stated in Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION after the Pre-Construction Meeting, shall prepare and submit for the Designer and the UMA Project Manager’s approval, a Schedule of Shop Drawings, Product Data and Samples required to be submitted for the Work. The schedule shall indicate, by Subcontractor, the date by which final approval of each item must be obtained, and shall be revised as required by conditions of the Work, subject to the UMA Project Manager’s approval. The Schedule of Shop Drawings, Product Data and Samples shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will be required on the site. Neither the Designer nor the UMA Project Manager will approve a schedule that calls for out-of-sequence submittals.

B. Shop Drawings:

1. Original drawings shall be prepared by General Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the Work, showing fabrication, layout, setting, or erection of details.
   a. Shop drawings shall be prepared by a qualified detailer.
b. Details shall be identified by reference to sheet and detail numbers indicated on Contract Drawings.
c. Maximum sheet size shall be 30-inch by 42-inch.
d. Submit with the required number of opaque prints specified and electronic media herein.

C. Product Data:

1. Manufacturers' catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data. Provide manufacturer's catalogue sheet, specification for each product and other pertinent data as required under the individual specification.
   a. Modify product data submittals to delete information which is not applicable to the project.
   b. Supplement standard information to provide additional information applicable to the project.
   c. Clearly mark each copy to identify pertinent materials, products, or models.
   d. Show dimensions and clearances required.
   e. Show performance characteristics and capacities.
   f. Show wiring diagrams and controls.

2. All such data shall be specific and identification of material or equipment submitted shall be clearly made in ink. Data of general nature will not be accepted.

3. Product Data shall be accompanied by transmittal notice. The General Contractor's stamp of approval shall appear on the printed information itself.

4. Submit the information listed above in both hard and electronic format.

D. Samples:

1. Physical samples shall illustrate materials, equipment, or workmanship, and shall establish standards by which work is judged. After review and approval, samples may be used in construction of project if not retained for comparison.
   a. Office samples of sufficient size and quantity shall clearly illustrate:
      1) Functional characteristics of product or material, with integrally related parts and attachment devices.
      2) Full range of color samples (including standard and premium ranges).
      3) After review and approval by Designer and the UMA Project Manager, samples may be used in construction of project if not retained for comparison.
   b. Field Samples and Mock-ups
      1) Erect at project site at locations acceptable to the Designer and the UMA Project Manager.
      2) Construct each sample of mock-up complete, including work of all Subcontractors required in finished work. Samples shall be incorporated into a larger mock-up with varied products and Subcontractors if required.

2. Unless otherwise specified in the individual Section, the General Contractor shall submit two labeled specimens of each Sample.

3. Samples shall be of adequate size to permit proper evaluation of material. Where variations in color or in other characteristics are to be expected, samples shall show the
maximum range of variation. Materials exceeding the variation of the approved samples will not be approved on the Work.

4. Samples which can be conveniently mailed shall be sent directly to the Designer, accompanied by transmittal notice. On the transmittal notice the General Contractor shall stamp his approval of Samples submitted.

5. All other Samples shall be delivered at the field office of the UMA Resident Engineer with Sample identification tag attached and properly filled in. Transmittal notice of Samples so delivered with the General Contractor's stamp of approval, shall be mailed concurrently to the Designer and the UMA Project Manager to confirm their receipt thereof.

6. If Sample is rejected by the Designer, a new Sample shall be resubmitted in the manner specified herein above. This procedure shall be repeated until the Sample is approved in writing by the Designer.

7. Samples will not be returned unless return is requested at the time of submission. The right is reserved to require submission of Samples whether or not specified in the Specifications, at no additional cost to the Commonwealth.

E. Mock-ups: Erect at project site at location acceptable to Designer and the UMA Project Manager, a mock-up complete, including work of all Subcontractors required in finished work.

1.4 GENERAL CONTRACTOR’S RESPONSIBILITIES:

A. Review shop drawings, Product Data and Samples prior to submission. Verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with Specifications.
5. Integration with adjoining work.
6. Delivery schedule.
7. Is the product an equal to the product specified or a substitution? If either of these occur a comparison sheet must be submitted comparing the proposed product to the product specified.

B. All shop drawings prepared by Subcontractors shall be processed through the General Contractor. The General Contractor shall check all the shop drawings for conformity with the Contract Documents and particularly for field measurements and proper fit with adjoining work prior to submitting same to the Designer for approval. Certification shall appear on each shop drawing stating that the General Contractor has made his/her check. Format and content of the General Contractor’s certification stamp shall be subject to approval by the UMA Project Manager and the Designer and shall include, but not be limited to:

1. The Term "By Others" shall not be used on shop drawings, the General Contractor shall state by whom related items are to be furnished and/or installed.
2. The Designer reserves the right to reject and return to the General Contractor, without examination, any shop drawings which have not been previously checked and certified as outlined above, which carry the term "by other" or such vague reference, which are
difficult to read, which have arrived by FAX or which in any way are obviously not in conformity with Contract Requirements.

3. Shop drawings shall show materials, design, dimensions, connections and other details necessary to ensure that they accurately interpret the Contract Documents and shall also show adjoining work in such detail as required to provide proper connection with same.

4. The Designer will check and approve shop drawings only for conformance with the design concept and for compliance with information given in the Contract Documents. Approval of shop drawings by the Designer will not release the General Contractor from his responsibility for furnishing same of proper dimensions, size quantity and quality to effectively perform the work and carry out the requirements and intent of Contract Documents.

5. Such approval will not relieve the General Contractor from responsibility for errors of any sort in the shop drawings, nor for the proper coordination of any submittal with all other work. If the shop drawings deviate, or are intended to deviate, from the Contract Documents, the General Contractor shall so advise the Designer in writing at the time the shop drawings are submitted, stating the difference in value between the Contract requirements and that denoted by said shop drawings.

6. The General Contractor shall assume full liability for delay attributed to insufficient time for delivery and/or installation of material or performance of the work when approval of pertinent shop drawing is withheld due to the failure of the General Contractor to submit, revise, or resubmit shop drawings in adequate time to allow the Designer and the UMA Project Manager a reasonable time, not to exceed twenty-one (21) calendar days, for normal checking and processing of each submission or resubmission.

C. Coordinate each submittal with requirements of Contract Documents.

D. The General Contractor's responsibility for errors and omissions in submittals is not relieved by the Designer’s review and approval of submittals, unless Designer gives tentative written acceptance of specific deviations identified as such by the General Contractor, subject to written concurrence by the UMA Project Manager.

E. Notify the Designer in writing at the time of submission, of deviations in submittals from requirements of Contract Documents or previous submissions.

F. Work that requires submittals shall not commence unless submitted with Designer’s stamp and initials or signature indicating review and approval, and UMA Project Manager’s initials or signature of concurrence indicate review and approval.

1. No work shall be started in the shop or on the job, or materials delivered to the site, until pertinent shop drawings have been approved by the Designer and the UMA Project Manager.

G. After aforesaid review and approval, distribute copies.

H. Maintain one (1) copy of each approved submittal at the project site, for the General Contractor.
1.5 SUBMISSION REQUIREMENTS:

A. General: All submittals shall be made to the Designer’s Office. The quantity and make-up of submittals shall be as established by the Designer; however, electronic copies of all submittals shall be transmitted to the UMA Project Manager at the same time that such submittals are transmitted to the Designer. The Designer will log and distribute submittals for review by his consultant engineers. The General Contractor shall distribute all Civil, Structural, and MEP shop drawings directly to the Designer. All submittals shall be in both hard and electronic copies.

B. Make submittals promptly in accordance with approved schedules, and in such sequence as to cause no delay in the work.

C. Submit number of samples specified in each Section of the Specifications.

D. Submittals shall include:

1. Date and revision dates.
2. Project title and number.
3. The names of:
   a. Designer;
   b. General Contractor;
   c. Subcontractor;
   d. Supplier;
   e. Manufacturer;
   f. Separate detailer when pertinent.
4. Identification of product or material.
5. Location of work and relation to adjacent structure or materials.
6. Field dimensions clearly identified as such.
7. Specification Section number and specific paragraph under which item is specified.
8. Submission number.
9. Applicable standards, such as ASTM number.
10. A blank space, five-inch by four-inch, for the Designer’s stamp.
11. General Contractor’s remarks. Identify exceptions or deviations from Contract Documents and reasons for them.
   a. If shop drawings submitted by the General Contractor indicate a departure from the Contract and the Designer deems it to be minor adjustment in the interest of UMA (subject to concurrence by the General Contractor stating it does not involve a change in Contract Price or extension of time), the Designer may approve the submission, but the approval shall be subject to UMA review and acceptance of the Designer’s recommendation.
   b. The approval of UMA shall be inferred to contain in substance the following: The change is so ordered with the understanding that it does not involve any change in the Contract Price or Time, and that it is subject generally to all contract stipulations and covenants, and is without prejudice to any and all rights of UMA under the Contract.
12. General Contractor's stamp, initialed or signed certifying review and approval of submittal.
13. Any other items as called for by the Designer, the UMA Project Manager or required by the manufacturers.
14. The Designer reserves the right to ask for shop drawings for any or all items on the project, whether or not requested in individual specification sections, at no additional cost to the Commonwealth.

1.6 RESUBMISSION REQUIREMENTS:

A. Resubmission: Resubmission procedure shall follow the same procedures as the initial submittal with the following exceptions:

B. Shop Drawings:
   1. Transmittal shall contain the same information as the first transmittal except that the submission number shall change sequentially. The drawing number/description shall be identical as the first transmittal but the date shall be the revised date for that submission.
   2. No new material should be included on the same transmittal for the resubmission.
   3. Indicate on drawings any changes which may have been made other than those requested by the Designer.

C. Product Data and Samples:
   1. Submit any new data and samples as required from previous submittal.

1.7 THE UMA PROJECT MANAGER’S AND DESIGNER’S REVIEWS AND DISTRIBUTION OF SUBMISSIONS

A. The UMA Project Manager and/or his/her designees will review submittals concurrently with the Designer and his/her consultant engineers. The Designer and the UMA Project Manager shall communicate within the aforesaid review period time frame (14 calendar days). The time frame for the Designer’s review will not exceed seven (7) 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 ‘no exceptions taken’, the Designer shall compose a transmittal indicating the status. The Designer shall attach his 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 Project Manager and the UMA Resident Engineer. The General Contractor shall then distribute said submittals to appropriate Subcontractors.

   2. If submittal is ‘resubmit’ or ‘rejected’, the Designer shall compose a transmittal indicating the status. The Designer shall attach his 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 to the UMA Project Manager and the UMA Resident Engineer, for their records.
3. If a submittal is ‘no exceptions taken’ 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 (14 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 fourteen (14) calendar days from the established date of each submission indicated on the Schedule of Shop Drawings, Product Data and Samples, plus the additional time, if any, for distribution by the General Contractor and receipt of submissions by the Designer and UMA Project Manager. The General Contractor is required to anticipate review time, including time for possible rejection and resubmission, in establishing Schedule dates.
   a. The aforementioned time provided the Designer for checking shop drawings is from the date of receipt of shop drawings by the Designer to the mailing date of shop drawings returned to the General Contractor by the Designer.

5. The Designer will process the submission and indicate the appropriate action on the submission and the transmittal. Incomplete or erroneous transmittals will be returned without action.

6. The Designer will fill out transmittal in the following sequence:
   a. Date received from General Contractor.
   b. Date forwarded to UMA Project Manager.
   c. Date received from UMA Project Manager.
   d. Date returned to General Contractor.
   e. Action taken on submission.
   f. Distribution, including number of copies distributed and type of material distributed (i.e., print, brochure or sample, etc.).
   g. Designer’s remarks (note major deviations from the Contract Documents).

B. Designer’s Review Procedure:

1. Stamped REVIEWED, “NO EXCEPTIONS TAKEN”:
   a. No corrections or resubmissions required, fabrication may proceed.

2. Stamped REVIEWED, “COMMENTS ATTACHED” or “NOTE MARKINGS”:
   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, “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,
D. Certificates of Compliance: Submit certificates of compliance with the associated Shop Drawings, Product Data, and Samples required for the product in quantities specified for certificates of compliance, with two (2) additional copies submitted to the UMA Project Manager and one (1) copy to the UMA Resident Engineer.

E. Field Samples: Provide field samples of finishes at the project as required by individual Specification Section. Install sample complete and finished.

F. Patterns and Colors: Submit accurate color charts and pattern charts to the Designer for review and selection whenever a choice of color or pattern is available in a specified product, unless the exact color and pattern of a product are indicated in the Contract Documents. Color and Pattern charts shall represent the manufacturer’s complete standard offerings, except where Specifications limit the offerings by defining a particular series or product type which is normally limited in color and pattern availability. Color and Pattern charts shall be submitted in quantities specified with two (2) additional copies submitted to the UMA Project Manager and one (1) copy to the UMA Resident Engineer.

1.8 SCHEDULE OF VALUES

A. Prior to the first request for payment, the General Contractor shall submit to the Designer and the UMA Project Manager, a Schedule of Values of the various portions of the Work in sufficient detail to reflect various major components of each Subcontractor, including quantities when requested, aggregating the total contract sum, and divided 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.

1. The General Contractor and all filed sub-bidders shall include on the Schedule of Values, a line item for “General Conditions” which shall equal roughly 10% of the respective contract value. This line items covers superintendence and management of the project, and will be paid out proportionally to the overall progress of the project.

2. Where materials are expected to be delivered to the site and requisitioned for prior to their installation, the value of the materials shall be shown separately from the value of the labor on the Schedule of Values.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 013543
ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS that are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Furnishing all labor, materials, and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operation under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water, and land, and involves management of runoff, dust, noise, and solid waste, as well as other pollutants. Work shall include installing, maintaining, and removing sedimentation and erosion control components within the Limits of Work.

C. This Section does not address erosion and sedimentation control requirements which are not anticipated for this project, as the scope of work is limited to interior renovation only.

1.3 SECTION INCLUDES

A. Applicable Regulations

B. Notifications

C. Protection of Groundwater

D. Protection of Streams And Wetlands

E. Protection of Land Resources

F. Protection of Air Quality

G. Maintenance of Pollution Control Facilities During Construction

H. Noise Control
I. Diesel Equipment Emission Controls

J. Spill And Discharge Control

1.4 RELATED SECTIONS

A. Section 015000 - TEMPORARY FACILITIES AND CONTROLS:

B. Section 024119 - DEMOLITION:

C. Section 020800 – ASBESTOS ABATEMENT

D. Section 020810 - DISTURBANCE OF LEAD CADMIUM & CHROMIUM ABATEMENT

1.5 APPLICABLE REGULATIONS

A. The General Contractor shall comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

B. Fines and related costs resulting from failure to provide adequate protection against any environmentally objectionable acts and corrective action to be taken are the obligations of the General Contractor.

1.6 NOTIFICATIONS

A. UMA may notify the General Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements may notify the General Contractor in writing, through UMA, of any non-compliance with State or local requirements. After receipt of such notice from UMA or from the regulatory agency through UMA, the General Contractor shall immediately take corrective action. Such notice, when delivered to the General Contractor or his/her authorized representative at the site of the Work, shall be deemed sufficient for the purpose. If the General Contractor fails or refuses to comply promptly, UMA may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the General Contractor unless it is later determined that the General Contractor was in compliance.

PART 2 - PRODUCTS

2.1 WATER

A. Water used for dust control and equipment washes shall be clean and free of salt, oil, and other injurious materials. The General Contractor shall provide all necessary water.
2.2 ONSITE SPILL KIT

A. The General Contractor shall provide the following minimum equipment to be kept onsite at all times during site work activities for any unexpected spills or discharges:

1. Sand, clean fill and absorbent pillows,
2. Four drums (55 gallon, U.S. DOT 17-E or 17-H),
3. Shovels, and
4. Steam cleaner for decontamination of tools and equipment.

PART 3 - EXECUTION

3.1 PROTECTION OF GROUNDWATER

A. Care shall be taken to prevent, or reduce to a minimum, any discharges to the ground of liquids that may infiltrate to the underlying groundwater or enter on-site waterways. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the groundwater or waterway shall not be discharged from the Site. Such waters shall be collected and disposed of by the General Contractor in accordance with all applicable Federal, State and local regulations.

3.2 PROTECTION OF STREAMS AND WETLANDS

A. Care shall be taken to prevent, or reduce to a minimum, any damage to any wetland from pollution by debris, sediment, or other material. Manipulation of equipment and/or materials in delineated wetland areas is prohibited. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in downstream waters of the State, shall not be discharged from the Site. Such waters shall be collected and disposed of by the General Contractor in accordance with all applicable Federal, State and local regulations.

3.3 PROTECTION OF LAND RESOURCES

A. Although the Work is expected to be an entirely interior renovation, should exterior work be required or should the site around the building be used to support the performance of the Work, the requirements of this Paragraph shall apply.

B. Land resources within the project boundaries and outside the limits of permanent work shall be restored to a condition, after completion of remediation activities that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to Limits of Work areas shown on the Drawing.

C. Outside of the Limits of Work as shown on the Drawing, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. Snow fence or other approved equal shall be erected at the “fall line” of the tree canopy, and no vehicles or storage will be permitted within, to prevent damage to trees.

D. The locations of storage and other facilities, required in the performance of the Work, shall not be within wetlands or resource areas.
3.4 PROTECTION OF AIR QUALITY

A. Burning – The use of burning at the project site for the disposal of refuse and debris will not be permitted.

B. Dust Control – Maintain all demolition excavations, stockpiles, waste areas, and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded (MADEP 310 CMR 7.09.-7.10) and which would cause a hazard or nuisance to others.
   1. Refer to Section 015000 – TEMPORARY FACILITIES AND CONTROLS for interior dust control requirements.

C. The General Contractor shall provide adequate means for the purpose of preventing dust and odor caused by construction operations throughout the period of the construction contract. If UMA or the Designer indicates that the level of dust or odors is unacceptable, the General Contractor shall employ measures necessary to reduce dust or odors to an acceptable level.

D. The General Contractor shall implement engineering controls (e.g. watering, misting) to control dust whenever required by the Designer or UMA.

3.5 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. During the life of this Contract, maintain all facilities constructed for pollution, erosion, and sedimentation control as long as the operations creating the particular pollutant area being carried out.

3.6 NOISE CONTROL

A. The General Contractor shall develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum. Local noise ordinances shall govern.

B. The General Contractor shall execute construction work by methods and by use of equipment which will reduce excess noise.

C. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

D. The General Contractor shall manage vehicular traffic and scheduling to reduce noise.

3.7 DIESEL EQUIPMENT EMISSION CONTROLS

A. All motor vehicles and construction equipment shall comply with all pertinent local, state, and federal regulations covering exhaust emission controls and safety.

B. All General Contractor and Subcontractor diesel-powered non-road construction equipment with engine horsepower (HP) ratings of 50HP and above, which are used on the Project Site for a period in excess of 30 calendar days over the course of the construction period on the Project Site, shall be retrofitted with Emission Control Devices in order to reduce diesel emissions.
C. The reduction of emissions of volatile organic compounds (VOCs); carbon monoxide (CO) and particulate matter (PM) from diesel-powered equipment shall be accomplished by installing Retrofit Emission Control Devices.

D. Acceptable Retrofit Emission Control Devices for the Project shall consist of oxidation catalysts or other comparable technologies that are (1) included on the US Environmental Protection Agency (EPA) Verified Retrofit Technology List and/or the California Air Resources Board Currently Verified Technologies List; and (2) are verified by EPA or CARB, to provide a minimum emissions reduction of 50 percent for VOCs, 40 percent for CO and 20 percent for PM. Attainment of the required reduction in PM emissions can also be accomplished by using less polluting Clean Fuels. Verified technologies can be identified on the following websites:

   EPA: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm
   CARB: http://www.arb.ca.gov/diesel/verdev/verifiedtechnologies/cvt.htm

E. The emission control equipment can be procured through the Statewide Contract #VEH71 that has fixed costs associated with retrofitting of diesel emission control devices. The following are the vendors listed on the State-wide Contract:

1) Cummins Northeast, Inc.
   Contact: Scot Lengel
   Telephone Number: 781-329-1750
   E-Mail Address: Scot.L.Lengel@cummins.com

2) Patriot International Trucks, LLC/Anderson International Trucks of Boston
   Contact: John Anderson, Jr.
   Telephone Number: 800-277-4777
   E-Mail Address: john@andersonmotors.com

3) Clean Diesel Technologies, Inc.
   Contact: Glen Reid
   Telephone Number: 203-327-7050
   E-Mail Address: greid@cdti.com

F. Construction shall not proceed until the General Contractor has submitted a certified list of the non-road diesel-powered construction equipment subject to this specification which either are or will be retrofitted with emission control devices. The list shall include (1) the equipment number, type, make, and General Contractor/Subcontractor name; and the emission control device make, model, and EPA verification number. General Contractors shall also submit a receipt or other documentation from a manufacturer or installer that verifies that appropriate equipment has been installed. The General Contractor shall also identify any vehicles that will use Clean Fuels. Equipment that has been retrofitted with an emission control device shall be stenciled or otherwise clearly marked as "Low Emission Equipment".

G. The General Contractor shall submit monthly reports, updating the same information stated in Paragraph F above, including the quantity of Clean Fuel utilized. The addition or deletion of non-road diesel equipment shall be indicated in the report.
H. The General Contractor shall use methods to control nuisance odors associated with diesel emissions from construction equipment including but not limited to the following: (1) turning off diesel combustion engines on construction equipment not in active use and on trucks that are idling for five minutes or more; and (2) locating diesel equipment away from the general public and sensitive receptors.

I. All costs associated with implementation of the diesel equipment emissions control shall be borne by the respective General Contractor or Subcontractor and included in their cost for performing the work of the Contract.

3.8 SPILL AND DISCHARGE CONTROL

A. The General Contractor shall provide equipment and personnel to perform emergency measures required to contain any spillage and to remove spilled materials and soils or liquids that become contaminated due to spillage. The collected spill material shall be properly disposed of at the General Contractor's expense.

B. Costs to provide the above spill and discharge control materials shall be included in the contract base bid price.

END OF SECTION
SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. General Contractor’s Quality Assurance.
B. General Contractor’s Testing Responsibilities.
C. UMA’s independent agencies.
D. Duties of the General Contractor’s testing agencies.
E. Welding.
F. Field engineering.
G. Examination of substrate.
H. General Contractor’s Quality Assurance and Quality Control Plan.

1.3 RELATED SECTIONS

A. Section 013100 – PROJECT MANAGEMENT AND COORDINATION:
   1. General project management and coordination.
B. Section 014325 – TESTING AGENCY SERVICES:
   1. Testing to be performed by the Owner’s Independent Testing Laboratory, exclusive of testing to be performed by the General Contractor.
1.4 GENERAL CONTRACTOR’S QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing services agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

B. Each independent inspection and testing agency engaged on the project shall be authorized by authorities having jurisdiction to operate in the Commonwealth of Massachusetts.

1.5 GENERAL CONTRACTOR’S TESTING RESPONSIBILITIES

A. The General Contractor shall provide inspections, tests and quality control services specified in individual specification Sections and required by governing authorities, except where they are specifically indicated to be solely the responsibility of a Subcontractor in the respective specification section or solely the responsibility of UMA.

B. Engage and pay for the services of an independent agency acceptable to the UMA Project Manager to perform the specified inspections, testing, and quality control. Submit qualifications to the UMA Project Manager. General Contractor’s testing agency/laboratory shall be licensed by the Commonwealth of Massachusetts Department of Public Safety.

C. Re-testing: The General Contractor is responsible for re-testing where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Documents requirements, regardless of whether the original test or service was the General Contractor’s responsibility.

D. Substitutions, Suspicious Issues and Designer Initiated Testing: The General Contractor is responsible for inspections, tests and similar services for substitutions, suspicious issues identified by the General Contractor or UMA Project Manager, and testing initiated by the Designer.

E. Associated Services: The General Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as required. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

1. Provide access to the work and furnish incidental labor and facilities necessary to facilitate inspections and tests.
2. Take adequate quantities or representative samples of materials that require testing or assist the agency in taking samples.
3. Provide facilities for storage and curing of test samples and delivery of samples to testing laboratories.
4. Provide the agency with a preliminary design mix proposed for use for material mixes that require control by the testing agency.
5. Provide security and protection of samples and test equipment at the project site.
F. The General Contractor shall prepare and submit to the UMA Project Manager for approval a Quality Assurance and Quality Control Plan within 30 days from Notice to Proceed. A Quality Assurance and Quality Control (QA/QC) Plan shall promote completion of all work in accordance with the Contract Documents including Contract, Construction Drawings, Specifications, Project Procedures, Approved Submittals and Shop Drawings, Approved Changes, Applicable Codes and Regulations, Referenced Industry Standards, and similar items. The primary purpose of this quality plan is to ensure that all in place work by the General Contractor and all Subcontractors is performed correctly the first time and is turned over and represented as complete and defect free in accordance with the Contract Documents.

G. A dedicated Quality Assurance and Quality Control Manager is not required for this project. The duties of the QA/AC Manager as delineated below shall be carried out by another qualified member of the General Contractor’s onsite staff.

1. Duties of the QA/QC Manager:
   a. Prepare and submit QA/QC Plan for approval.
   b. Conclude and submit minutes for all requisite Quality Meetings.
   c. Coordinate and report on all daily quality activities.
   d. Verify accurate documentation by Subcontractors and Vendors.
   e. Oversee final project records pertaining to quality.
   f. Report, photograph and distribute evidence of deficient and/or defective construction conditions or materials that cannot be corrected within three work days of observation. When such conditions or materials are remedied report, photograph and distribute evidence of remedial work prior to concealing. Photographs shall be dated and defects and/or deficiencies shall be clearly labeled on the photographs.

1.6 UMA’S INDEPENDENT TESTING AGENCIES

A. UMA will engage an independent testing agency at its own expense to perform certain tests and similar services as set forth in Section 014325. Information provided by UMA’s Independent Testing Agency shall be for the sole use of UMA's Project Manager, and shall not relieve the General Contractor of its responsibilities to provide its own quality control, to meet all requirements of the Contract and to provide a completed project free from construction defects.

B. It is the General Contractor’s responsibility to provide and pay for its own inspection and testing to assure quality control. General Contractor shall be responsible for coordinating its work with requirements of UMA's testing agencies, and shall provide reasonable services in support of facilitating work of UMA's testing agencies as required.

1.7 DUTIES OF THE GENERAL CONTRACTOR’S TESTING AGENCIES

A. The General Contractor’s independent testing agency engaged to perform inspections, sampling and testing of materials and construction shall cooperate with the Designer and General Contractor in performing its duties, and shall provide qualified personnel to perform required inspections and tests.
B. The testing agency shall notify the Designer and General Contractor promptly of irregularities or deficiencies observed in the work during performance of its services.

C. The testing agency shall not perform any duties of the General Contractor.

D. The General Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.8 GENERAL CONTRACTOR’S QUALITY CONTROL REQUIREMENTS, GENERAL

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of the quality as specified.

B. Comply fully with manufacturer's instructions, including each step in sequence.

C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

D. Perform work by persons qualified to produce workmanship of specified quality.

E. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortions, or disfigurement. Anchorage devices shall be labeled to allow for visual inspection and verification of type of anchorage device.

1.9 WELDING

A. Certified Welders:

1. Structural welds shall be made only by operators who have been qualified by tests, as prescribed in the "Standard Qualification Procedure" of the American Welders Society, to perform the type of work required. Operators shall be certified welders; certification must be shown to the Resident Engineer and must be current. Provide a copy of certification(s) to the UMA Resident Engineer.

2. Pipe welds shall be made by operators who have been qualified by the National Certified Pipe Welding Bureau and each operator's qualification record shall be submitted to the Designer before any work is performed. Welders' certification card must be shown to the Resident Engineer. Provide a copy of certification(s) to the UMA Resident Engineer.

3. Shop welding shall be in accordance with the "Code for Welding in Building Construction."

4. Welders shall provide their own portable generating equipment for electric welding. Use of the Commonwealth's electrical system for welding will not be permitted.

B. Welding and Cutting:

1. Where electric or gas welding or cutting work is done above or within ten (10) feet of combustible material or above a space that may be occupied by persons, use interposed...
shields of incombustible material to protect against fire damage or injury due to sparks and hot metal.

2. Place tanks supplying gases for gas welding or cutting at no greater distance from the work than is necessary for safety, securely fastened and maintained in an upright position in accordance with applicable codes. Store such tanks in a locked enclosure remote from any combustible material and free from exposure to the rays of the sun or high temperatures.

3. Maintain suitable fire extinguishing equipment near all welding and cutting operations. When operations cease for the noon hour or at the end of the day, thoroughly wet down the surroundings adjacent to welding and cutting operations.

4. Station a workman equipped with suitable fire extinguishing equipment near welding and cutting operations to see that sparks do not lodge in floor cracks or pass through floor or wall openings or lodge in any combustible material. Keep the workman at the source of work which offers special hazards for thirty (30) minutes after the job is completed to make sure that smoldering fires have not been started.

5. Place a qualified electrician in charge of installing and maintaining electric and arc welding equipment. Remove damaged electric, arc or gas welding equipment from the site.

1.10 MANUFACTURER'S REPRESENTATIVES

A. If required by specific Specification Sections, manufacturer's representative shall be present at the job site for supervision of work during installation of materials. Such representative shall be present during all aspects of construction to ensure proper installation of all applicable items. Refer to other sections of these specifications for additional requirements.

1.11 FIELD ENGINEERING

A. Survey work is not anticipated on this project, as the Work is entirely interior and does not involve any sitework.

1.12 EXAMINATION OF SUBSTRATE

A. Installers of materials, products or equipment shall:

1. Examine base surfaces upon which materials, products or equipment are to be installed.
2. Examine conditions upon which materials, products or equipment are to be installed.
3. Where there is any question as to the dryness of a surface, test with a modern moisture-indicating machine.
4. Notify the General Contractor, in writing, with a copy to the Designer, if conditions are detrimental to proper and timely construction and completion of the work.

B. Do not proceed with work until unsatisfactory substrate, or not acceptable conditions have been corrected. Commencement of installation constitutes acceptance of substrate or base surfaces, and the cost of any corrective work due shall be borne by the installer applying his/her materials, products or equipment thereon.
1.13 GENERAL CONTRACTOR’S QUALITY ASSURANCE AND QUALITY CONTROL PLAN

A. The General Contractor’s Quality Assurance and Quality Control Plan shall instill an expectation that all work will be completed correctly and in an expeditious manner. In all instances the General Contractor shall be responsible for the adherence to and enforcement of the General Contractor’s Staff and all Subcontractors to this plan.

1. Submit the General Contractor’s Quality Assurance and Quality Control Plan to the UMA Project Manager within 30 days from the Notice to Proceed. Submit in format acceptable to UMA’s Project Manager. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out General Contractor’s quality-assurance and quality-control responsibilities. Coordinate with General Contractor’s construction schedule.

B. The Plan shall include specific procedures for conducting formalized inspections of predetermined selected work items at the time the General Contractor first starts new work. These inspections are performed by a designated QA/QC Inspection Team composed of authorized representatives from UMA, the General Contractor, A/E, Subcontractor(s) (whose work is being inspected) and others as may be required.

C. The Quality Assurance and Quality Control Plan shall be created as a General Contractor Project Specific Quality Plan addressing at a minimum the following components:

1. Quality meetings.
   a. Pre-construction conference.
   b. Pre-installation review meetings.
   c. Coordination meetings.
2. Regular Daily Inspections.
3. First Delivery of Material / Equipment Inspections.
4. First Equipment in Place Inspections.
5. Mock-up Inspections.
6. In-Wall and Above Ceiling Inspections.

D. Quality Meetings:

1. Pre-construction Conference:
   a. A conference held to discuss all aspects of the construction project such as the schedule, payment procedures, change order procedures and much more. This meeting is held immediately after contract award.
   b. The UMA Project Manager, Designer, Design Consultants, General Contractor and Subcontractors will attend these meetings.
2. Pre-Installation Review Meetings:
   a. A review meeting shall be held for certain kinds of work requiring special coordination efforts between Subcontractors, a better understanding of how the work is to be performed by one or more Subcontractors, sequencing of work between the Subcontractors, or a review of special requirements pertaining to the work to be performed. This type of meeting is conducted just prior to starting the
actual work. The meeting is scheduled and run by the General Contractor on an as needed basis.

b. The UMA Project Manager, Designer, General Contractor and all applicable Subcontractors will attend these meetings.

c. The General Contractor’s Staff and Subcontractor’s actual supervisory people who will be performing the work in the field are to attend these meetings.

d. Safety precautions relating to the work to be performed are also to be discussed as part of this meeting.

3. Coordination Meetings:

a. The General Contractor shall conduct project Coordination Meetings at regular intervals. Project Coordination Meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings. An example would be regularly scheduled MEP coordination meetings to monitor the progress of the MEP coordination process.

b. General Contractor shall request representation by every party currently involved in coordination or planning for the construction activities involved.

c. General Contractor shall record meeting results and distribute copies to everyone in attendance and others affected by decisions or actions resulting from each meeting. The UMA Project Manager and the Designer are to be on the Distribution List.

E. Regular Daily Inspections:

1. The General Contractor will monitor the quality of the in-place construction work daily, to ensure that it complies with the requirements of the Contract Documents, Pre-Construction Meetings, Pre-Installation Meetings and Coordination Meetings.

2. The General Contractor shall log, record and distribute daily record of quality monitoring as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action.

3. The QA/QC Inspection Team will inspect work periodically based on observations noted in General Contractor’s reporting to verify completion and compliance.

F. First Delivery of Material/Equipment Inspection:

1. The General Contractor shall manage and keep current an anticipated delivery schedule for all materials and equipment to be delivered to the site and provide regular updates or upon request to the UMA Project Manager and QA/QC Inspection Team.

2. The General Contractor shall log, record and distribute any account on the first delivery of each type of material or equipment as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action.

3. First deliveries will be verified against the requirements of the design documents and the approved submittals. Nonconforming materials and/or equipment will not be allowed to be set into place and will be removed from the site.

4. This inspection establishes the basis for judging all future deliveries of like material/equipment.

G. First Equipment In Place Inspection:
1. The General Contractor shall manage and keep current an anticipated schedule for all materials and equipment to be inspected in place and provide regular updates or upon request to the UMA Project Manager and QA/QC Inspection Team.

2. General Contractor and QA/QC Inspection Team will inspect and document the first setting of equipment to verify it is in conformance with the requirements of the Contract Documents.

3. The installation and assembly will be verified against the requirements of the design documents and the approved shop drawings.

4. The General Contractor shall log, record and distribute any account for each type of first in place equipment inspection as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action or pending inspection.

5. Upon acceptance of the equipment in place, the General Contractor can proceed with permanently anchoring it into place by the means prescribed in the Contract Documents.

6. This inspection establishes the basis for judging all future setting of like equipment.

H. Mock-Up Inspections:

1. The General Contractor will note all Mock-Ups required by the Contract Documents and include the activity in their construction schedule and submit for review and approval of the UMA Project Manager, the Designer and the QA/QC Inspection Team.

2. The General Contractor shall log, record and distribute any account of Mock-Up(s) as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up, and inspection.

3. General Contractor will benchmark each work type within the Mock-Up for conformance with the requirements and review with the QA/QC Inspection Team.

4. The QA/QC Inspection Team shall review, comment that the work appears in conformance to the requirements. Comments are documented and distributed by the General Contractor. Non-conforming work will be corrected at no additional cost to UMA.

5. The approved Mock-Up establishes a basis for judgment for all later like construction.

6. The Mock-Up process and inspection(s) does not take away from the responsibility of the General Contractor and installing contractors to provide a finished and fully functioning product and to maintain the construction schedule.

I. In Wall and Above Ceiling Inspections:

1. It is the intent of this section to mandate inspection of as much of the work that is to be enclosed before it has been covered over to avoid having to reopen closed spaces to complete or correct work therein.

2. The General Contractor shall verify that all work is complete within the concealed space and is ready to be inspected before it is enclosed.

3. The General Contractor and all Subcontractors who have work installed within the work area shall sign a closure form stating that their work has been completed and has been inspected by all applicable code officials. General Contractor will be responsible for all costs to have the space reopened later to complete or correct any work within the space, and to have the space closed again, including all costs incurred for any schedule impacts due to this work.
4. Photographs of areas to be permanently enclosed will be taken by General Contractor and retained as a part of the project record.

5. The General Contractor shall log, record and distribute account of below grade, in wall or above ceiling inspections as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up.

6. No closure or covering of work shall proceed until all requirements are met and approval given by the QA/QC Inspection Team where such inspections are to be conducted.

J. Utility Activation and Start-Up Inspection Procedures for Equipment/Systems Prior to Validation.

1. Activation Inspection:
   a. The Activation Inspection is required when the General Contractor has verified that system work meets the contract document requirements and has completed the static installation of equipment/systems, and is ready to place it into dynamic operation for the purposes of shakedown, debugging, check-out and similar activities.
   b. The General Contractor shall log, record and distribute any account of pending activations as a component of daily reporting and provide separate individual notification at a minimum of 48 hour notice prior to the scheduled time for placing specific equipment into dynamic operation.
   c. The General Contractor will notify the QA/QC Inspection Team who will inspect the work, the surroundings and provide comment that the installation is safe and appears meets the requirements for operation.
   d. Any deficiencies noted shall be corrected immediately
   e. The General Contractor will then place the equipment/systems into operation for his use, shakedown, debugging, check-out, and similar activities.

2. Start-Up Inspection:
   a. The General Contractor will coordinate with UMA’s Commissioning Agent to ensure that start-up procedures, O&M’s, prefunctional checklists and testing, equipment manufacturer’s representation are completed and/or in place according to the approved Commissioning Plan.
   b. The General Contractor shall log, record and distribute any account of pending startups as a component of daily reporting and provide separate individual notification at a minimum of 48 hour notice prior to the scheduled time for placing specific equipment into final operation.
   c. The General Contractor shall coordinate with the QA/QC Inspection Team and UMA CA to ensure that the installation operates as required.
   d. All non-conforming work will be corrected immediately.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 014200

REFERENCES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract including, but not limited to, the following:

1. UMA.
2. The Designer (the Architect-of-Record or Engineer-of-Record as applicable).
3. The UMA Project Manager.
4. The UMA Resident Engineer.
5. The General Contractor.

B. "Reviewed": When used to convey Designer's action on General Contractor's submittals, applications, and requests, "reviewed" is limited to Designer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Designer. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities subject to UMA approval. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source, and have available on site for reference.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

- AA Aluminum Association, Inc. (The)
- AAMA American Architectural Manufacturers Association
- AASHTO American Association of State Highway and Transportation Officials
- ABAA Air Barrier Association of America
- ACI ACI International (American Concrete Institute)
- AGC Associated General Contractors of America (The)
- AIA American Institute of Architects (The)
- AISC American Institute of Steel Construction
- AISI American Iron and Steel Institute
- ALSC American Lumber Standard Committee, Incorporated
- AMCA Air Movement and Control Association International, Inc.
- ANSI American National Standards Institute
- APA APA - The Engineered Wood Association
- ARMA Asphalt Roofing Manufacturers Association
- ASCE American Society of Civil Engineers
- ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers
- ASME ASME International
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Name</th>
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<tbody>
<tr>
<td>ASTM</td>
<td>ASTM International (The American Society of Mechanical Engineers International)</td>
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<tr>
<td>AWI</td>
<td>Architectural Woodwork Institute (American Society for Testing and Materials International)</td>
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<td>AWPA</td>
<td>American Wood-Preservers' Association</td>
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<td>AWS</td>
<td>American Welding Society</td>
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<tr>
<td>BHMA</td>
<td>Builders Hardware Manufacturers Association</td>
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<tr>
<td>BIA</td>
<td>Brick Industry Association (The)</td>
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<td>CDA</td>
<td>Copper Development Association</td>
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<td>CISCA</td>
<td>Ceilings &amp; Interior Systems Construction Association</td>
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<td>CRI</td>
<td>Carpet &amp; Rug Institute (The)</td>
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<td>CSI</td>
<td>Construction Specifications Institute (The)</td>
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<td>DHI</td>
<td>Door and Hardware Institute</td>
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<td>EPA</td>
<td>Environmental Protection Agency (United States)</td>
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<td>FM</td>
<td>Factory Mutual</td>
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<td>FMRC</td>
<td>Factory Mutual Research (Now FM Global)</td>
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<td>FSC</td>
<td>Forest Stewardship Council</td>
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<tr>
<td>GA</td>
<td>Gypsum Association</td>
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<td>GANA</td>
<td>Glass Association of North America</td>
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<td>GS</td>
<td>Green Seal</td>
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<tr>
<td>HPVA</td>
<td>Hardwood Plywood &amp; Veneer Association</td>
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<tr>
<td>ICRI</td>
<td>International Concrete Repair Institute, Inc.</td>
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<td>IESNA</td>
<td>Illuminating Engineering Society of North America</td>
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<tr>
<td>ILI</td>
<td>Indiana Limestone Institute of America, Inc.</td>
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<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
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<td>ISSFA</td>
<td>International Solid Surface Fabricators Association</td>
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<td>ITS</td>
<td>Intertek Testing Service NA</td>
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<td>LEED</td>
<td>Leadership in Energy &amp; Environmental Design (USGBC)</td>
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<td>MFMA</td>
<td>Maple Flooring Manufacturers Association, Inc.</td>
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<td>NAAMM</td>
<td>National Association of Architectural Metal Manufacturers</td>
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<td>NAIMA</td>
<td>North American Insulation Manufacturers Association</td>
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<tr>
<td>NBQQA</td>
<td>National Building Granite Quarries Association, Inc.</td>
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<tr>
<td>NCMA</td>
<td>National Concrete Masonry Association</td>
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<tr>
<td>NeLMA</td>
<td>Northeastern Lumber Manufacturers' Association</td>
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<td>NEMA</td>
<td>National Electrical Manufacturers Association</td>
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<tr>
<td>NFPA</td>
<td>NFPA (National Fire Protection Association)</td>
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<tr>
<td>NFRC</td>
<td>National Fenestration Rating Council</td>
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<tr>
<td>NOFMA</td>
<td>NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)</td>
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<tr>
<td>NRCA</td>
<td>National Roofing Contractors Association</td>
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<tr>
<td>NSF</td>
<td>NSF International (National Sanitation Foundation International)</td>
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<tr>
<td>NTMA</td>
<td>National Terrazzo &amp; Mosaic Association, Inc. (The)</td>
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<tr>
<td>NWWDA</td>
<td>National Wood Window and Door Association (Now WDMA)</td>
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<tr>
<td>SDI</td>
<td>Steel Deck Institute</td>
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<td>SDI</td>
<td>Steel Door Institute</td>
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B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of current edition of Codes in the Commonwealth of Massachusetts.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 014325
TESTING AGENCY SERVICES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. UMA will engage an independent testing agency at its own expense to perform certain testing, to confirm compliance with contract requirements and criteria described in the various Specification Sections and as the UMA Project Manager deems appropriate. It is the General Contractor’s responsibility to provide and pay for its own inspection and testing. See Section 014000.

B. Refer also the list of testing below, and to individual Specification Sections for the types and frequency of testing to be performed by UMA’s independent testing laboratory.

1.3 RELATED SECTIONS

A. GENERAL CONDITIONS

1. Inspections and testing required by laws, ordinances, rules, regulations, or orders of public authorities.

B. Section 014000 – QUALITY REQUIREMENTS

1. General Contractor’s responsibility for testing services to maintain quality control.

1.4 UMA TESTING AGENCY SERVICES

A. UMA testing agency services may include, but not be limited to, the following:

1. Asbestos monitoring and air clearance testing.
2. Firestopping.
3. Laboratory equipment including emergency showers, eyewash stations, fume hoods and bio-safety cabinets.
4. Others as required to demonstrate compliance with Contract requirements.

B. Each independent inspection and testing agency engaged on the project shall be authorized by
authorities having jurisdiction to operate in the Commonwealth of Massachusetts.

1.5 ENGAGEMENT OF INDEPENDENT TESTING LABORATORY

A. UMA will engage and pay for the services of independent inspectors and an independent testing laboratory to perform the services specified under various Sections of the Specifications.

B. The services of a testing laboratory as specified in this Section is intended for the UMA Project Manager's verification of the General Contractor’s compliance with the requirements of the Contract Documents. This shall in no way relieve the General Contractor of its responsibilities to provide its own quality control, to meet all requirements of the Contract and to provide a completed project free from construction defects.

C. Services and quantities of testing as specified herein are approximate and may vary. Actual services and quantities of testing will be determined by the UMA Project Manager and the Designer during the construction period.

D. Locations for taking sample specimens for testing shall be as directed by the UMA Project Manager and the Designer-of-Record.

1.6 GENERAL CONTRACTOR’S RESPONSIBILITIES

A. Cooperate with laboratory personnel and provide access to the work and to fabricator’s facilities as required for the performance of their testing.

B. Provide Casual Labor and Facilities:

1. To provide access to the work to be inspected or tested.
2. To obtain and handle specimens at the site.
3. To facilitate inspections and tests.

C. Shop Drawings: Provide a complete set of construction documents and shop and/or erection drawings for the items being inspected and tested.

D. Samples:

1. Provide the laboratory with preliminary representative samples of materials to be tested, in requested quantities.
2. When the source, quality, or characteristic of an approved source changes or indicates lack of compliance with contract requirements, submit additional samples of materials to testing laboratory.

E. Miscellaneous Reports, Lists: When requested by the Designer or testing laboratory, the General Contractor shall immediately provide copies of mill reports, cutting lists, shipping bills, material bills, time and place of shipment of materials to shop and field, and any relevant data on pressure testing and investigations of materials.
F. Notification:

1. To facilitate the timely sequence of inspection and testing, the General Contractor shall give advanced notification to the testing laboratory and the Designer that work has progressed to the point where inspection and testing may proceed.
2. Advanced notification shall be 48 business hours (minimum) prior to commencement of activity requiring testing and inspection.

1.7 GENERAL CONTRACTOR’S QUALITY CONTROL

A. Services of testing laboratory retained by UMA is for verification of General Contractor’s compliance and, if such tests or inspection indicates failure to comply with these Contract Documents, the General Contractor shall bear all costs associated with additional testing and inspection after the work has been corrected, to verify compliance.

B. Provide a Quality Control Program, to the UMA Project Manager and the Designer for their approval that includes monitoring and enforcement of the quality programs of all Subcontractors. See Section 014000 Quality Requirements.

1.8 PATCHING

A. Areas where samples are taken for purposes of testing shall be patched by the General Contractor to the satisfaction of the UMA Project Manager and the Designer-of-Record.

1.9 REPORTING OF RESULTS

A. The testing laboratory shall document the values obtained in all tests, and shall indicate degree of compliance with the requirements of the Contract Documents. Test reports shall include the following information:

1. Designer’s project name and number.
2. Type and location of test sample and time and date obtained.
3. Type of test, ASTM or other appropriate designation.
4. Result of test and degree of compliance with Contract Documents.

B. Testing laboratory shall, on a weekly basis, distribute results of all tests as follows:

1. UMA – 1 copy
2. Designer – 1 copy
3. Consulting Engineers (as designated by the Designer) – 1 copy
4. General Contractor – 1 copy
5. Subcontractor – 1 copy

C. Notify all parties immediately in the event that test results indicate that strengths, required by the Contract Documents, will not be attained.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

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. Temporary Facilities and Controls including the following:
  1. Temporary Water.
  2. Weather Protection.
  3. Heating During Construction.
  4. Temporary Power.
  5. Hoisting Equipment and Machinery.
  8. Dust Control.
 10. Indoor Air Quality (IAQ) Management.
 11. Enclosures.
 12. Cleaning During Construction.
 13. Field Offices.
 15. Sanitary Facilities.
 17. Parking.
 18. Debris Control and Removal.
 22. Construction Fence.
 23. Project Identification Sign.
 25. Shut Down Notice.
 27. Covered Walkways
 28. Excavations and Field Survey Requirements
1.3 TEMPORARY WATER

A. Water available within the project area, may be used by contractors provided it is not used wastefully.

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

C. Any temporary hoses and pipe lines and connections from the permanent service lines either outside or within the building, necessary for the use of the General Contractor and his Subcontractors shall be installed, protected, and maintained at the expense of the Plumbing Subcontractor.

D. Temporary hoses and temporary pipe lines used for transporting water shall not be run unattended or unprotected across parking areas, parking area entrance, walkways, plazas, or steps. Temporary hoses and temporary pipelines shall not be permitted to be installed along, through or across corridor and occupied rooms or spaces.

E. Contractors are advised that the water within the lab areas is non-potable, and should not be used for drinking water. The General Contractor shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for his employees and those of his Subcontractors.

F. Use of the water may be discontinued by the Commonwealth if, in the opinion of the UMA Project Manager, it is wastefully used.

1.4 WEATHER PROTECTION

A. Although this project is primarily an interior renovation, State Law requires that the General Contractor 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), if required for performance of the work. Under no circumstances shall the General Contractor suspend any work during the months of November through March because of their reluctance to provide and pay for temporary weather protection. These Specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible to protect in the judgment of the Designer. Included in the preceding category, without limitation, are such items as site work, excavation, steel erection, erection of certain "exterior" wall panels, roofing, and similar operations.

B. "WEATHER PROTECTION" shall mean the temporary protection of that work adversely affected by moisture, wind, and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the Designer and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The General Contractor shall furnish and install all "weather protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 50 degrees F. at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the
applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the General Contractor.

C. Within 30 calendar days after his award of contract, the General Contractor shall submit in writing to the Designer for approval, three copies of his proposed methods for "Weather Protection."

D. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.

E. The General Contractor shall furnish and install one accurate Fahrenheit thermometer at each work area as designated by the Designer. However, one additional accurate Fahrenheit thermometer shall be provided for every 2,000 square feet of floor space where the work areas exceed 2,000 square feet.

1.5 HEATING DURING CONSTRUCTION

A. Contractors may utilize the building’s existing heating system, and shall maintain it in continuously operational service for the duration of the project, to the greatest degree possible.

B. Disconnection of, or suspension of the functionality of heating or ventilating equipment requires a shut down notification to be filed with the University.

C. If shutdowns or demolition of existing heating equipment will be for a duration long enough to adversely affect the temperature of the building, the heating contractor shall provide temporary heat as required.

1.6 TEMPORARY POWER

A. The University will provide electrical energy required for temporary light and power. Use of the electrical energy may be discontinued by the University, if, in the opinion of the UMA Project Manager it is wastefully used. Then, the University will direct the General Contractor to pay for the furnishing and installing, by the Electrical Subcontractor, of a watt-hour demand meter and associated current transformers and if required, potential transformers to measure energy consumed from the University. The General Contractor shall pay for the energy consumed from the University for the remainder of the construction period.

B. Any temporary wiring of a special nature, other than that specified in Division 26, Electrical Work, shall be paid for by the Subcontractor requiring it, such as: Special circuits required by electric welders, elevators, lifts or other special equipment requiring high-amperage and/or special voltage service, etc.

C. The General Contractor and all Subcontractors, individually, shall furnish all extension cords, sockets, lamps, motors, and accessories required for their work. They shall also pay for all temporary wiring of construction offices and buildings used by them.
D. All temporary wiring installed by the Electrical Subcontractor shall be removed after it has served its purpose. Use copper wire only.

E. During electrical shut-downs, the electrical contractor shall arrange and pay for, and provide necessary connections, for temporary power for the building by generator, to protect sensitive scientific equipment.

1. Note: A generator is not required if:
   a. A localized (not building wide) shutdown is under 2 hours and only once a day, as long as the shutdown notice as defined in section 1.26 is adhered to.
   b. A localized shutdown:
      1) affects only one area at a time
      2) critical equipment (refrigerators, freezers) remain powered by extension cords are run to adjacent areas with power, provided by the electrical subcontractor
      3) and this lasts no longer than 8 hours.

1.7 HOISTING EQUIPMENT AND MACHINERY

A. All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in safe condition by the individual Subcontractors and is so stated in each appropriately related Section of the Specifications. All costs for hoisting operating services shall be borne by the Subcontractors unless specifically excepted in the Contract Documents.

1. A licensed equipment manufacturer’s representative shall be present at all times, to witness the erection and dismantling of all hoisting equipment and machinery, whenever such equipment is being erected or dismantled. No such work will be performed without the presence of such representative.

2. Hoisting equipment and machinery erection and dismantling shall be performed only by trained, certified, and experienced riggers qualified to perform such work.

3. Copies of such licenses and/or certifications, clearly indicating qualifications, shall be provided to the UMA Resident Engineer prior to commencement of such erecting and dismantling work.

B. Review Drawings for hoisting requirements and openness of traffic access routes to installed destinations of specified equipment and furnishings.

1.8 STAGING

A. All staging, planking and scaffolding, exterior and interior, required for the proper execution of the work and over eight feet in height, shall be furnished, installed, and maintained by the General Contractor.
1. Erection and dismantling of staging shall be performed only by trained, certified, and experienced staging personnel qualified to perform such work.

2. Copies of such certifications, clearly indicating qualifications, shall be provided to the UMA Resident Engineer prior to commencement of such erecting and dismantling work.

B. All staging up to eight feet in height shall be provided by the individual Subcontractors as applicable to their work.

1.9 MAINTENANCE OF ACCESS

A. The General Contractor shall provide and maintain for the duration of his contract, a means of access to, around and within the site, as indicated on the Contract Drawings, for vehicular traffic and authorized personnel. This means of access shall be construed to sustain the weight of equipment customarily engaged for use in construction projects of this type and magnitude. The General Contractor shall, without additional compensation from the Commonwealth, furnish labor and materials as may be required from time to time to maintain this means of access in an acceptable condition as determined by the Designer. Pedestrian access shall provide adequate protection against falling debris, slippage, adequate lighting, warning and directional signs, and protection against construction activities.

1.10 DUST CONTROL

A. The General Contractor shall have all Subcontractors provide adequate means for the purpose of preventing dust caused by construction operations from creating a hazard, nuisance, and from entering adjacent occupied areas throughout the period of the construction contract.

B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the General Contractor.

C. Provide tacky walk-off mats at all entrances to work areas, and change regularly to prevent dust from being tracked into other parts of the building.

D. The general contractor shall damp mop corridors daily during demolition and drywalling activities, and shall damp mop as required throughout the balance of the project, to the University’s satisfaction.

E. Utilize exhaust to maintain negative room pressure relative to adjacent spaces.

F. Contractors are advised that the adjacent labs will remain operational throughout this project, and many labs perform research that is dust-sensitive. If adjacent labs are adversely affected by dust generated through construction, they shall be cleaned at the contractor’s expense to the researchers’ requirements.
1.11 NOISE CONTROL

A. Work must be scheduled and performed in such a manner as to not interfere with the operations of the Owner. Construction work that is deemed by the 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. Comply with requirements of authorities having jurisdiction. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

C. Execute construction work by methods and by use of equipment which will reduce excess noise.
   1. Equip air compressors with silencers, and power equipment with mufflers.
   2. Manage vehicular traffic and scheduling to reduce noise.
   3. No heavy equipment may be started or idled before 7 A.M.
   4. Hammer drilling will be restricted after 8 A.M., cannot be constant, and must be coordinated with UMA.

1.12 ENCLOSURES

A. Provide temporary, insulated, weather tight closures of openings in exterior surfaces for providing acceptable working conditions and protection for materials, allowing for heating during construction, and preventing entry of unauthorized persons. Provide doors with self-closing hardware and locks.

B. All utilities including electric ducts, conduits, telephone lines, sprinklers, and other utilities shall be protected against damage from construction activity. The General Contractor shall be responsible for all damage to the utilities from construction and shall repair all such damage at no additional cost to UMA.

C. Provide temporary partitions and ceilings as required to separate work areas from occupied areas, to prevent penetration of dust and moisture into occupied areas, to prevent damage to existing areas and equipment. Construction shall be framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces; (STC rating 35 in accordance with ASTM E900. Flame Spread Rating of 25 in accordance with ASTM E84. Paint surfaces exposed to view in occupied areas.)

1.13 CLEANING DURING CONSTRUCTION

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

   1. Refer to Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for additional requirements.

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site in a legal manner. The General Contractor shall bear all costs, including fees resulting from such disposal.
C. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finish operations.

D. Maintain project in accordance with all local, Commonwealth of Massachusetts, and Federal Regulatory Requirements.

E. Store volatile wastes in covered metal containers, and remove from premises.

F. Prevent accumulation of wastes which create hazardous conditions.

G. Provide adequate ventilation during use of volatile or noxious substances.

H. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish and waste materials on site.
   2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
   3. Do not dispose of wastes into streams or waterways.
   4. Identify potential sources of cleaning water runoff and propose abatement procedures.

I. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

J. Use only those cleaning materials and methods recommended by manufacturer of surface materials to be cleaned.

K. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.

L. Provide on-site containers for collection of waste materials, debris, and rubbish.

M. Remove waste materials, debris and rubbish form the site periodically and dispose of at legal disposal dump site (DEP approved).

N. Handle material in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

O. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.

1.14 FIELD OFFICES

A. The General Contractor may utilize the project areas for temporary field offices during construction. Any damages to materials or finishes within the project areas caused by the Contractor or his forces shall be corrected prior to final completion, at no cost.
B. An office trailer will not be required for the UMA Project Manager, and will not be permitted on site for the Contractor.

C. Computers: Use of computers by Contractors on site is encouraged to streamline the exchange of information, however, no computers will be provided by UMA for contractor’s use. Limited wireless internet connectivity is available on site, through the University’s Office of Information Technology (OIT). Wired connections can be arranged through OIT at the Contractor’s discretion and expense.

1.15 TELEPHONE SERVICE

A. All project managers and superintendents for all trades shall maintain cellular telephones throughout the project duration. Such individuals shall be reachable by Owner and Designers during normal work hours. List all numbers on the Project Directory.

1.16 SANITARY FACILITIES

A. The existing toilet rooms within the building may be used by construction personnel. The General Contractor shall take responsibility for maintenance and cleaning of such areas and shall leave them in first class condition equal to the accepted conditions of toilet facilities not used for construction personnel.

1.17 CONSTRUCTION BARRIERS

A. Proper construction barriers shall be provided around the contract work areas as defined by the Contract Drawings or as directed by the Resident Engineer.

B. Construction barriers shall consist of traffic cones, ribbons, tapes, secure fencing, trench covers, wood barriers, warning signs, directional signs, and other traffic materials to keep traffic and people from area of construction and maintain ongoing operations.

C. Barriers shall be erected at such approved locations as are necessary, sufficiently cross-braced and supported adequately from floors and ceilings as required.

1.18 PARKING

A. Parking: Parking spaces on Campus are very limited and the University will not provide designated parking lot spaces near the construction site for the Contractor’s use. The Contractor shall contact Parking Services (545-0065) to determine the location of the nearest available parking spaces. The Contractor will be required to pay all fees for parking.

1.19 DEBRIS CONTROL AND REMOVAL

A. Debris shall not be permitted to accumulate or migrate and the work shall at all times be kept satisfactorily clean. Facility trash receptors shall not be used for the disposal of debris.
Dumpster shall be provided by the General Contractor for removal of debris for all Subcontractors.

B. Remove debris from the work site on a daily basis and dispose of same at any (private or public) DEP approved dump that the General Contractor may choose providing that the General Contractor shall make all arrangements and obtain all approvals and permits necessary from the owner or officials in charge of such dumps. Proposed dump site shall be submitted to be approved by UMA prior to start of demolition. During disposal process, copies of daily receipts from dumpsite shall be submitted on a regular basis.

1.20 SAFETY PROTECTION

A. At no time shall the work be left unattended without proper safety protection and shall not be left unprotected to the weather and accessible to the public. It is the responsibility of the General Contractor to maintain proper safety protection for the public while work is in progress or unattended.

1.21 VEHICLE AND EQUIPMENT PROTECTION

A. All construction activities shall be performed in such a manner so as not to dust, stain or damage any building elements, equipment, vehicles, etc. within general vicinity of the construction work area. Any damage to these items shall be cleaned and repaired at the expense of the General Contractor.

1. All construction vehicles and equipment on site shall be effectively disabled and secured when not in use.

1.22 SHORING

A. The Subcontractors shall provide all temporary shoring and bracing as required for the proposed work. Comply with all applicable codes and standards.

1.23 CONSTRUCTION FENCE

A. Due to the limited space available around the building, exterior storage of materials will be permitted on site in a lay-down area approximately 30’ x 40’, provided on the West side of Morrill I where indicated on the site plan. The General Contractor shall erect and maintain fencing around the lay-down area for as long as materials are stored there.

B. Construction fences shall be six feet high and of chain link, or approved equal, erected in a substantial manner, straight, plumb and true as approved by the Designer.

C. Gates shall be built into fence at such approved locations as are necessary, well cross-braced and hung on heavy strap hinges with proper post and hook for double gates. Provide heavy hasps and padlocks for each gate. Provide a set of three keys for each lock to UMA Project Manager and Resident Engineer to facilitate emergency access.
D. Fencing shall be removed by the General Contractor at no cost to the Commonwealth at such time before final completion as the Designer directs. Restore site to acceptable condition after removing fence.

1.24 PROJECT IDENTIFICATION

A. No project sign is required. If the contractor elects to provide a sign at his own expense, it shall meet the graphic standards of UMA for construction signage and be installed where directed.

1.25 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.

C. Contractors may utilize the existing loading dock on the first floor of Morrill IV North for deliveries. Trucks shall unload and depart in a timely manner, and unloaded materials shall be moved to the project site immediately upon receipt and not left on the loading dock.

1.26 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.

1.27 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 the Contractor will supply and install Best construction cores (coordinate with UMA PM and Lock Shop). The Contractor will be required to provide keys for the construction cores to the lock shop, the UMA Project Manager and the UMA Construction Engineer. At completion of the construction work the contractor will remove the construction cores and the lock shop will reinstall the appropriate final core.

1.28 COVERED WALKWAYS

A. Install temporary overhead protection at building entrances, for an appropriate distance from the building, when performing construction work above the entrance on the roof or building façade.
B. Comply with standards and code requirements for erecting structurally adequate overhead protection. Erect overhead protection using appropriate scaffold and wood plank decking to provide safe passage.

1.29 EXCAVATIONS AND FIELD SURVEY REQUIREMENTS

A. No excavation or survey work is anticipated for this project. The Work is generally limited to the fourth floor of the building.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
PART 1 - GENERAL

1.1 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. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other Sections for specific requirements and limitations applicable to cutting, patching and fire-stopping individual parts of the Work.

1. Requirements of this Section apply to mechanical and electrical installations. Refer to Divisions 21-26 for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

2. The general contractor shall provide coring of all holes for pipes or conduits 3" in diameter or greater for all sub-contractors. For the purposes of bidding, hole size shall be defined as the outside diameter of the pipe and conduit, exclusive of insulation, sleeves or annular space, however, the actual diameter of the hole to be cored shall be the size required for insulation, sleeves, etc.

3. The general contractor shall provide cutting of all openings larger than one square foot in size for all sub trades. The general contractor may elect, at his expense, to perform all of the cutting required for the project. Sub-contractors shall coordinate their cutting requirements accordingly, in a timely manner.

4. All patching shall be performed by the General Contractor and/or the appropriate finish trade sub-contractors (i.e. painting by painting sub-contractor). Patching shall not be performed by Mechanical or Electrical sub-contractors.

5. All firestopping on new penetrations or penetrations left from the removal of utilities, shall be performed by the trade using the hole in the rated construction to be firestopped, using products specified in Section 078413.

6. All firestopping of existing, non-firestopped penetrations, which are uncovered as the Work progresses shall be performed by the General Contractor. Refer to Section 078413 for products.
C. The Contractor shall be made aware that asbestos-containing materials are present throughout the building. Any new work called for by the Drawings that will disturb asbestos-containing materials will require abatement to be performed as outlined under Section 020800 - Asbestos Abatement of the Contract. However, the Contractor shall be made aware that 100% abatement of all asbestos materials located throughout each work area will not be performed and that contact with any remaining asbestos materials should be avoided. The Contractor is hereby made aware of this requirement and shall be responsible for all costs associated with compliance with OSHA 29 CFR 1926.1101 Regulations with regards to protection of workers (as deemed necessary by each trade). As part of the Contract, UMASS shall provide one (1) "Asbestos Awareness" Training class for the all trades that will perform work on the project. The duration of the training shall be two (2) hours in length and will be held on-site prior to the start of the work.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures a minimum of 10 working days in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform Work.

4. Indicate dates when cutting and patching is to be performed.

5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

B. Approval by the Designer to proceed with cutting and patching does not waive the Designer's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
B. Obtain approval of the cutting and patching proposal from the Designer before cutting and patching the following structural elements:

1. Foundation construction.
2. Bearing and retaining walls.
4. Structural steel.
5. Lintels.
6. Timber and primary wood framing.
7. Structural decking.
8. Stair systems.
9. Miscellaneous structural metals.
10. Exterior curtain wall construction.
11. Equipment supports.
12. Piping, ductwork, vessels and equipment.
13. Structural systems of special construction in

C. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal from the Designer before cutting and patching the following operating elements or safety related systems:

   a. Shoring, bracing, and sheeting.
   b. Primary operational systems and equipment.
   c. Air or smoke barriers.
   d. Water, moisture, or vapor barriers.
   e. Membranes and flashings.
   f. Fire protection systems.
   g. Noise and vibration control elements and systems.
   h. Control systems.
   i. Communication systems.
   j. Conveying systems.
   k. Electrical wiring systems.

D. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Designer's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

E. If possible, retain the original installer or fabricator to cut and patch the following categories of exposed Work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm for the following work:

1. Processed concrete finishes.
2. Stonework and stone masonry.
3. Ornamental metal.
5. Preformed metal panels.
6. Window wall system.
7. Stucco and ornamental plaster.
8. Finished wood flooring.
11. Aggregate wall coating.
12. Wall covering.
13. HVAC enclosures, cabinets or covers.

F. Cutting and patching will be required within, over or above certain occupied lab areas to facilitate demolition and new work specified elsewhere.

1. Identify, in a timely manner, any equipment or materials which should be relocated to permit the required Work. No claims for delays will be entertained due to inadequate advance notice to UMA of such requirements.

2. Coordinate and schedule cutting and patching operations around researcher’s work. Perform Work in a manner to minimize the amount of time required in occupied areas.

3. Provide temporary dust protections and other measures as required by UMA, to maintain continued operation of research activities. Where utilities are scheduled for demolition, provide protections as required against the possibility of water spills from pipes being removed. Remove all protections immediately upon completion of work.

PART 2 - PRODUCTS

2.1 MATERIALS

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

B. Concrete, where used to patch abandoned penetrations in floors or roofs, shall be:

1. Normal weight concrete proportioned in accordance with ACI 211.1 and ACI 30 for 4,000 psi compressive strength @ 28 days.

2. At openings over 6" wide, provide ASTM A 615/A 615M, Grade 60, deformed reinforcing bars doweled into to the existing slab 48" on center, both sides, staggered.

3. At horizontal openings less than 6" wide, chip out the top of the opening to enlarge it, creating a tapered or conical hole to patch, such that the patch material cannot drop through the hole.
C. Grout, where used to close annular space around floor or wall penetrations, shall be:

1. non-shrink type, prepackage and preproportioned, requiring only the addition of potable water before use, meeting or exceeding the following standards:
   a. General Properties: ASTM C 1107-02
   b. Compressive strength: ASTM C 109
   c. Bond Strength: ASTM C 882

D. Lintels, where required at openings cut in exterior masonry walls for new windows, shall be cold-rolled steel, ASTM A36 in grade, and hot-dipped galvanized to G-60 standards. Fabricate loose lintels to sizes noted on the Drawings.

E. Sheet metal, used to patch openings cut in interior metal-skinned walls within the building, shall be plain steel, minimum 24 gauge, secured with pan-head sheet metal screws.

F. Roofing: any cutting or patching of the existing roof shall be performed by a qualified roofer authorized by the membrane manufacturer. Any patching work performed shall be acceptable to the membrane manufacturer for maintaining the warranty.

PART 3 - EXECUTION

3.1 INSPECTION

A. The General Contractor shall be responsible for cutting and patching, as specified in Part 1.

1. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

2. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. Inspect areas where cutting and patching is to be performed, prior to the start of the work, and record any existing damage to surrounding materials which could be construed as having been caused by cutting or demolition operations. Advise Resident Engineer before proceeding, or photograph existing damage and submit photos to Architect.

C. Sub trades shall inspect existing plumbing systems prior to any cutting or demolition for leaks which could be construed as having been caused by contractor’s operations. Advise Resident Engineer before proceeding, and allow the University’s Physical Plant to repair leaks if the University so desires. Any new leaks which develop after cutting or demolition operations are performed, shall be repaired by the appropriate trade at no additional cost.

D. Prior to cutting or coring, the contractor shall thoroughly investigate concealed construction as required, through the use of inspection holes, record drawings and other
means available, to confirm the areas to be disturbed do not contain hidden utilities.

1. Where cutting or coring of concrete is required, the general contractor shall retain a firm to perform Ground Penetrating Radar (GPR) scans of the subject area, to identify concealed utilities. These services shall be part of the general contractor’s bid, and are not reimbursable.

2. Sub contractors shall cooperate with the general contractor, by laying out all required penetrations for scanning, so that services of the GPR firm can be minimized.

3. The contractor shall adjust coring and cutting locations as required to clear buried utilities, at no additional cost to the contract. Sub contractors shall have personnel present at the time of scanning, to decide on the suitability of alternative locations proposed by the GPR firm.

4. The contractor is responsible for the accuracy of the scans. If utilities are cut or damaged, and require repair, they shall be repaired at no cost to the contract.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or duct work serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Where required to maintain an existing product or system warranty, such as a roof warranty, employ a manufacturer's approved and warranted Contractor to perform the cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a Carborundum saw or diamond core drill.

4. Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and backfilling.

5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

6. Make cuts in exterior concrete and asphalt with Carborundum or diamond coated blades or bit; jack hammering or chipping is not permitted. Angle blade slightly when cutting to create a beveled edge, which will prevent the patch from lifting. Restore base or sub grade with similar materials, compacting as required, prior to patching.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. In occupied areas, perform patching as soon as possible after completion of work related to the cutting and patching. Verify with occupants that finishes to be applied will not have a negative effect on research being performed, and adjust scheduling of finishing, or products to be used accordingly.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

4. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch, after the patched area has received primer and second coat.

   a. In the case of corridors, or surface areas much larger than the patch itself, extend
the touch-up to the nearest adjacent door frame, window, heater or other visual break-point in the surface being touched up.

5. Patch, repair or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance.


7. Patch asphalt surfaces with hot mix asphalt only - cold patch will not be permitted. Heat edges of patch by blowtorch prior to placing new mix. Fill patch area completely, and compact by hand-tamping to a uniform level surface.

D. Plaster Installation: Comply with manufacturer's instructions and install thickness and coats as indicated.

1. Unless otherwise indicated provide 3-coat Work.

2. Finish gypsum plaster with smooth-troweled finish. Sand lightly to remove trowel marks.

3. Cut, patch, point-up and repair plaster to accommodate other construction and to restore cracks, dents and imperfections.

3.4 FLOOR CORING

A. Coring of floors over occupied areas will require coordination with researchers and the ongoing research on floors below. At a minimum, the contractor performing the coring will be responsible for:

1. Advising the researcher of what equipment and instrumentation must be relocated while the work is being performed.

2. Relocating and reinstalling ceiling tiles, to prevent dust and debris from coring operations from dropping on top of tiles.

3. Providing suitable protective measures to prevent dust and debris infiltration into the areas.

4. Cleaning of the area below the core, immediately following completion of the coring.

B. Coordinate all coring to occur during the same operational shutdown. If all operations cannot be completed in a single day, coordinate work to be performed after hours, or on weekends.

C. Remove dust protection, clean any dust and debris from operations as directed by researchers, and restore lab to original operational condition.
D. Coring over occupied spaces shall be treated as a shutdown. Refer to 015000.

3.5 FLOOR PATCHING

A. The 1st and 3rd floor project area shall be made uniform and homogeneous to protect the floors below from damage due to water spills and leaks, dust and debris entry. Every hole in the project area floor, new or existing, shall be infilled in one of the following manners:

1. Where pipes penetrate the floor slab, install a steel sleeve extending above the floor and grouted to the floor slab solidly as detailed on the Drawings. Firestop the annular space between the pipe and sleeve to a 1-hour rating.

2. Where pipes or ducts are removed, or where existing cores without pipes exist, fill the core solid with grout for small openings and concrete for larger openings.

B. Prior to infill, vacuum all penetrations thoroughly, to prevent dust and debris from falling into the space below.

C. Prevent grout from falling through the floor opening to the rooms below.

D. In both applications, grout shall extend the full depth of the floor slab thickness, less the space required at the underside of the slab for formwork or other supporting material.

E. All floor patches shall be complete before any water piping in the project area is connected to any building water source.

3.6 CLEANING

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

END OF SECTION 017329
SECTION 017419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for recycling and disposing of construction waste.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 013543 - ENVIRONMENTAL PROTECTION PROCEDURES:
   a. Environmental-protection measures during construction.

2. Section 020800 – ASBESTOS ABATEMENT
   a. Removal and disposal of all asbestos-containing-materials (ACMs) and work impacting ACMs to remain in place.

3. Section 020810 - Disturbance of Lead Cadmium & Chromium Abatement:
   a. Removal and disposal of items containing Lead, Cadmium and Chromium.

1.3 DEFINITIONS

A. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waste or debris.

B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, and/or installation of new materials as part of remodeling, renovation, or repair operations. Construction waste includes packaging.

1. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations prior to renovations or remodeling.

C. Disposal: Removal off-site of construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: A Waste Management Plan will not be required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DISPOSAL OF WASTE

A. Except for items or materials to be recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. For solid waste disposal facilities located in the Commonwealth of Massachusetts, dispose of materials only in facilities which currently comply with applicable state regulations, including requirements of 310 CMR 16.00 {Site Assignment for Solid Waste Facilities} and 310 CMR 19.000 {Solid Waste Management}, and local bylaws.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION
SECTION 017700

CONTRACT CLOSEOUT

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 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 broken or defective glass not required to 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:

<table>
<thead>
<tr>
<th>Pure Seed Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky Blue Grass 85/80</td>
<td>34.72%</td>
</tr>
<tr>
<td>Creeping Red Fescue</td>
<td>24.68%</td>
</tr>
<tr>
<td>Omega III Perennial Rye Grass</td>
<td>19.82%</td>
</tr>
<tr>
<td>Saturn Perennial Rye Grass</td>
<td>19.78%</td>
</tr>
</tbody>
</table>

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, or marked accurately on the as-built reflected ceiling plans.
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.
   *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 by the lock shop.

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.

f. Exclusive of other items that the DPS inspector may impose, there is a history of specific items that are essential for, temporary occupancy. These items include, but are not limited to the following:

(1) Properly colored and positioned exit signs.

(2) Properly located emergency lighting fixtures.
(3) Clean ducts, blowers, and coils if units were operated without filters during construction.
(4) Install permanent filters and replace disposable filters if units were operated during construction.
(5) Properly working lock for the medical environmental closets (if applicable).
(6) Assure that exterior and interior fire rated and egress doors are operating properly and have the proper hardware.
(7) Assure that smoke barriers are properly installed and located.
(8) Assure that proper water pressure is provided for the sprinkler system.
(9) Assure that proper hot water temperatures are provided. Unless otherwise specified or required by a User Agency, the temperature set on building master controllers of hot water shall apply:
   (a) HW to toilet rooms and janitors closets shall be 140˚ F.
   (b) HW to individual tubs or showers shall be controlled, in addition to the master controller above, with thermostatic valves set to furnish HW at a temperature not exceeding 110˚ F and equipped with anti-scald feature.
   (c) HW rinse water to dishwashers shall be controlled at 180˚ F.
(10) Emergency eyewash equipment must be hard-plumbed and employ tempered water.

g. Evidence of compliance with requirements of governing authorities including, without limitations, the following:
1) Certificate of Inspection, in form of signed permits from the electrical, plumbing, gas, fire department, boiler, and any other required inspectors.
2) Certification from the local fire department to the effect that all detection, alarm and suppression systems, and other equipment or systems under fire department jurisdiction are approved.
3) When carpeting and/or draperies are provided, a flame, smoke and fuel-rating certificate provided by the supplying General Contractor.
4) Elevator certification(s) from the elevator inspector obtained through the General Contractor’s elevator subcontractor.
5) A letter from the Plumbing Subcontractor that the potable water supply has been sanitized.
6) Septic system certification obtained from the town by the General Contractor (when applicable).
7) Pressurized vessel certifications from the boiler inspector obtained through the Mechanical Subcontractor.
8) When air balancing is required, the air balancing report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable).
9) When smoke control/fire emergency ventilation system is required, the test report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable).
10) Evidence of test and approval for Department of Environmental Protection (DEP) and Department of Public Health (DPH), when applicable.

F. Prerequisites for UMA Certificate of Agency Use and Occupancy: UMA Certificate of Agency Use and Occupancy E-1 Form. Prior to requesting a Division of Capital Asset Management (UMA) Certificate of Agency Use and Occupancy, the UMA Resident Engineer will procure and have ready and available the following approved items (referred to as Closeout Submittals):
1. Operating and maintenance (O & M) manuals and written operating instructions for the various systems.
2. Catalog data sheets for each item of mechanical or electrical equipment actually installed including performance curves, rating data and parts lists.
3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical and electrical equipment controls and fixtures with all details clearly indicated, including size of lamps.
5. Names, addresses, and telephone numbers of repair and service companies for each of the major systems installed under the construction contract.
6. Signed Department of Public Safety (DPS) Certificate of Occupancy per 780 CMR 120.0
9. Subcontractor Affidavits that specified equipment and installed items have been seismically braced in accordance with code requirements.
10. Monetized punch list of the remaining Work that must be done before Final Acceptance.
11. As-built documents should be completed (both electronic files and transparencies) and ready to transfer over to the UMA Project Manager. As-built documents shall consist of, but not be limited to, the following:
   a. Drawings (in AutoCAD ver. 2000 or later format)
      1) Contract drawings, for all disciplines, marked-up to clearly indicate as-built conditions.
      2) All clarification and/or changed conditions sketches (SK’s).
   b. Specifications (in .pdf format)
      1) All construction specifications.
      2) All addenda.
   c. Shop drawings, submittals, etc. (scanned format)*
      1) All approved shop drawings, submittals, etc.
12. Approved documents submitted to the UMA or the Designer shall be electronically scanned (including the associated transmittals and, where applicable, the Designer-of-Record’s and UMA’s comments) as a .pdf document. All scanned approved submittals shall be included on a CD.
13. The electronic file names, for each approved submittal, shall contain the following information:
   a. For APPROVED or APPROVED AS NOTED Shop Drawings:
      1) Project Number Submittal’s Date, APPROVED, Submittal Name, Submittal’s Specification Section Name and Number, and Submittal’s Revision Number.
      2) As an example, the file name of an approved submittal for Concrete
         a) Design Mix: DFS991DC1 030106 APPROVED Concrete Design Mix Cast In Place Concrete 033000 Rev0.PDF
   b. For Shop Drawings submitted for information only, e.g. welders certificate, the electronic file name shall contain the following information:
      1) Project Number Submittal’s Date, FORINFO, Submittal Name, Submittal’s Specification Section Name and Number, and Submittal’s Revision Number.
      2) As an example the file name of a for information only submittal for a welder’s certificate:
a) DFS991DC1 030106 FOR INFO Welders Certificate Quality Requirements 014000 Rev0.PDF

c. Unless otherwise stated all submitted documents shall include an electronic scanned image as noted above.
d. The electronic file name shall be printed on every shop-drawing page.

14. The UMA Project Manager will attach the monetized punch list to the UMA Certificate of Agency Use and Occupancy, indicate the official date of Use and Occupancy, establish the date upon which all remaining punch list items must be completed (normally 30-45 calendar days), and procure appropriate signatures on the original and seven (7) copies.

15. After receipt of signatures, the UMA Project Manager will distribute the signed copies.

16. Project schedules (in Primavera format, unless otherwise authorized), baseline, and all updates.

17. Notification to Operating Agency and/or User Agency of Proposed Use and Occupancy Date: The UMA Project Manager is to notify the Operating Agency and/or User Agency of the project Use and Occupancy date at least seven (7) calendar days in advance.

G. Prerequisites for UMA Certificate of Final Inspection, Release, and Acceptance: UMA Final Certificate of Final Inspection, Release, and Acceptance (E-2 Form). Upon receipt of the UMA Certificate of Agency Use and Occupancy, and its adjunct monetized punch list, the General Contractor shall cause the completion of all of the other punch list items within timeframe required by said certificate, but not more than 45 calendars days if the timeframe is not indicated on the said certificate.

1. If the General Contractor fails to pursue completion of the remaining monetized punch list work, on a continual basis, within the timeframe required by the certificate, UMA may, after seven (7) calendar days written notice, elect to complete the work with separate forces and charge the work against the General Contractor.

2. At the end of the General Contractor’s one (1) year guarantee period, the General Contractor shall transfer manufacturers’ equipment and material warranties that are still in force to the Operating Agency.

1.9 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 warrantees 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. The Contractor must be familiar with all other Divisions and Sections of the Specification which affect the work of this Section.

1.02 DEFINITIONS

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

"Site": Refers to the Morrill Science IV North Building located 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 Nault Architects Inc., 71 Hope Avenue, Worcester, 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.

"General Contractor": Refers to the Contractor who has been awarded the overall contract for renovation work outlined by the Contract Documents.

"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 (DLWD) 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, Architect or Consultant shall also reserve the right to research and utilized other information received from any other projects completed by the Asbestos Abatement Contractor 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. The Asbestos Abatement Contractor shall be responsible for verifying 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 and no compensation shall be granted for variations in the quantities presented herein.
C. The following Scope of Work and Requirements shall be applicable for asbestos abatement work at Morrill Science I and IV North. 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 coordinate with the General Contractor as to the locations of areas to be abated in accordance with the Scope of Work outlined herein and the Drawings.

3. 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 waste, unless otherwise determined by the Consultant.

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 DLWD regulations governing work area set-up for asbestos abatement. This process shall be applicable for all work areas deemed to contain impervious surfaces by the Asbestos Abatement Contractor. In addition, 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 deficient by the Owner's Consultant and/or a state or federal agency. If the variance is not permitted 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. The following requirements shall be applicable for abated of all floor tile and mastic at the site:

- Removal of existing floor tile and associated mastic/backing shall include all layers of such materials and associated mastic/backing (including glue, levelastic, grout, caulking, etc.) down to the existing concrete floor throughout each area.
• The Asbestos Abatement Contractor shall remove all material by manual and/or mechanical means. ABATEMENT OF THE TILE AND MASTIC USING CHEMICAL SHALL NOT BE PERMITTED.

• All cabinets, countertops, dividers, wall partitions, rugs, carpet, etc. located within a room shall be removed by the Asbestos Abatement Contractor in order to perform abatement of all material. All rugs/carpet present on the flooring shall be removed and disposed of as asbestos waste, unless otherwise determined by the Consultant.

• At locations where the floor tile is located beyond the limits of work specified herein, (i.e. adjacent areas not in the Contract.) removal shall include the tile up to the outside portion of the door jamb/threshold or to the next full tile to remain. The tile shall be “squared off” in a professional manner to allow for new replacement tile to be installed by the General Contractor. Any damaged to tiles to remain beyond that point resulting from the Abatement work shall be replaced at no cost by the Asbestos Abatement Contractor.

• All damaged caused to the floor or wall surfaces as a result of the abatement shall be repaired by the General Contractor.

7. The following requirements shall be applicable for abatement of all pipe and fitting insulation at the site:

• The Asbestos Abatement Contractor shall be required to perform all wall, ceiling and floor demolition required to access pipe insulation specified for abatement herein.

• All demolition work shall take place under full containment and all demolition debris shall be disposed of as asbestos waste (unless otherwise determined by the Consultant).

• For ACM fittings on fiberglass lines, removal shall also include six (6) inches of fiberglass to each side of the fitting being abated. All material shall be disposed of as ACM.

• At locations where pipe insulation is located above ceilings to be removed in their entirety, removal shall also include all drop-in ceiling tiles and grid systems as part of the abatement work. Removal shall include the tiles, insulation, grid work, hangers, light fixtures, etc. throughout each area. The ceiling tiles and all permeable items shall be disposed of as ACM. All non-permeable items shall be disposed of as ACM or properly decontaminated, passed out of the work area and disposed of as regular construction debris. The entire area above the ceiling shall be cleaned and decontaminated as part of the work. This shall include, but not be limited to all equipment, duct work, piping, beams, conduit, horizontal/vertical surfaces, etc.

• At locations where a section of ceiling is to be removed for new work as indicated by the Drawings, removal shall include the affected ceiling tiles (without damage) in order for the pipe insulation above to be abated. The ceiling
tiles shall be removed (without damage) and turned over to the General Contractor who will reinstall them after the work has been completed. In addition, the immediate area within the ceiling opening shall also be cleaned and decontaminated as part of the work.

8. The following requirements shall be applicable for abatement of the foam board, mastic, tar, paper, waterproofing, etc. located on the perimeter walls where penetrations are to be cut for new work outlined by the Drawings:

- The Asbestos Abatement Contractor shall coordinate with the General Contractor as the specific locations and limits of the walls to be cut.
- The work includes removal of the foam board, pins, adhesive, mastic and tar located on the perimeter wall.
- The work shall also include cutting open the wall to access the waterproofing paper/mastic, etc. located within the wall cavity.
- All abated materials, including the CMU block shall be disposed of as ACM.
- All work shall take place under full containment under negative pressure and a three stage decontamination unit.
- The Asbestos Abatement Contractor shall remove all material by manual and/or mechanical means.
- 100% of the mastic will be required to be abated from the substrate and no staining, residue in cracks, etc. shall be permitted to remain.

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

1.05 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. Copy of the asbestos Notification (ANF01)
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
5. Proposed waste hauler and disposal site for asbestos
6. Copy of proposed Waste Shipment Record to be used for disposal of asbestos.

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
1.06 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.

1.07 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, 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.

1.08 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.

1.09 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 and General Contractor.

1.10 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.

1.11 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 doorway's at the end of the work day. Signs will be posted prior to asbestos removal as required in 29 CFR 1926.1101.

1.12 PROJECT MONITOR

A. The Architect (on behalf of the Owner) has retained ATC as their Consultant for the technical advisement and project management during the Project. In addition, ATC will perform project monitoring services during abatement activities. The Contractor shall regard ATC’s direction, as authoritative and binding as provided herein, in matters outlined by this Section.

B. ATC’s licensed Project Monitor, acting as the Owner’s Representative, will perform monitoring of Contractor 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. ATC’s Project Monitor will review matters relating to safety, interpretation of the specifications, and scheduling of work, and will make decisions upon consultation with the Architect and Owner.

1.13 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 Owner, 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 openings 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 DLWD 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 DLWD 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 (2) layers of four 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 one layer of four 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 shall be performed by the Project Monitor for all areas.

3.03 DISPOSAL

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 BREATHE 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 UMASS’s approved “Asbestos Waste Shipment Record”. A copy of the UMASS Asbestos Waste Shipment Record shall be provided to the Asbestos Abatement Contractor during the pre-construction meeting for the project. A representative from UMASS EH&S 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.

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. Phase Contrast Microscopy (PCM) clearance testing will be performed to confirm the completion of removal. All clearance testing shall be performed in accordance with state of Massachusetts 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 for each sample.
Note: Should results indicate a fiber concentration greater than the clearance criteria stated above or 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 ASBESTOS-CONTAINING MATERIALS
<table>
<thead>
<tr>
<th>NO.</th>
<th>BUILDING</th>
<th>ROOM/LOCATION</th>
<th>FLOOR</th>
<th>MATERIAL</th>
<th>QUANTITY</th>
<th>NOTES</th>
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<td>Foam Board/Mastic</td>
<td>Refer to Drawings at locations for wall cuts/penetrations</td>
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</tbody>
</table>

EA = Total Unit/Component
LF = Linear Foot
SF = Square Foot

ATTACHMENT A - SECTION 02080
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 Morrill Science I & IV North Buildings located 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 Nault Architects Inc., 71 Hope Avenue, Worcester, 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 buildings 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 for performance of the renovation and/or demolition work outlined under this Contract. The buildings are not considered residences where children under the age of six (6) reside, therefore, abatement of lead-containing components will not be required as per Massachusetts Department of Public Health (DPH) "Child Lead Poisoning and Prevention Regulations.

E. However, 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 pipe 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 as well as 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 lead, cadmium or chromium 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 Engineer 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
SECTION 024119

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 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. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.2 WORK INCLUDES

A. Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following major items:

1. Salvaging existing furniture, equipment and other items as indicated or directed, protection of all salvaged items and reinstallation in new locations within the project area.

2. Demolition of existing interior construction including but not limited to:
   a. Flooring, other than asbestos-containing materials. Repair of flooring substrate where required.
   b. Walls, including finish, framing and all accessories such as tackboards, chalkboards, coat hooks etc.
   c. Doors, frames and hardware.
   d. Casework, including base and wall cabinets, worksurfaces, counters, backsplashes, cleats anchors and all related accessories. This includes the installation of some Owner-furnished casework.
   e. Fume hoods and other lab equipment.
   f. Ceilings, including all framing, supports, hangers, etc.

3. Demolition of, or revision of, all existing mechanical and electrical equipment and services scheduled for demolition, by the appropriate sub-trade, following procedures specified in Divisions 22 - 27

4. Disposal of demolished items.
1.3 WORK SPECIFIED IN OTHER SECTIONS

A. Section 017329 - Cutting & Patching: Minor cutting/coring of existing materials to allow installation of new piping and conduits.

B. Section 020800 - Asbestos Abatement: Procedures for removal of asbestos containing materials (ACMs), including but not limited to VAT and pipe insulation.

C. Section 020810 - Disturbance of Lead Cadmium & Chromium Abatement

D. Section 078413 - Penetration Firestopping: infill of new and existing holes where fire rating is required.

E. Division 220001 - Plumbing: Removal of existing plumbing items scheduled to be removed.

F. Division 230001 - HVAC: Removal of all heating and ventilation components scheduled to be removed.

G. Division 260001 - Electrical: Removal of all electrical components scheduled to be removed.

1.4 SUBMITTALS

A. Refer to SECTION 013300 - SUBMITTALS for submittal provisions and procedures.

B. Schedule: Provide detailed sequence of demolition and removal work.

1.5 JOB CONDITIONS

A. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

B. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

1. Provide protective measures as required to provide free and safe passage of Owner's personnel.

2. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations. Protect site with suitable coverings when necessary.

3. Remove protections at completion of work.

C. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no
cost to Owner.

D. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

E. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

F. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

G. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Owner. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

H. Environmental Controls: Use temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection. Provide negative air equipment throughout demolition as a means of dust and odor control.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to commencement of demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Architect prior to starting work.

B. Contractors are advised that the building will remain occupied during construction and that work within adjacent laboratories will be required.

1. Every contractor working in occupied lab spaces will be required to first take a lab safety training course, provided by UMA Environmental Health and Safety. One such class will be provided by UMA Environmental Health & Safety department - coordinate the attendance of required labor force accordingly.

3.2 COORDINATION

A. All contractors are advised that the building will be occupied throughout construction, and that research is performed in labs at random hours, 7 days a week. Access to rooms and areas outside of the spaces being renovated, must be coordinated with building staff through the Resident Engineer.
B. Rooms below the first floor project area are involved in ongoing research. Special coordination will be required for work above and within these rooms. Cleaning of these rooms is of particular importance, and UMA personnel will train demolition contractors on protection and cleaning requirements.

C. Any shutdowns required to perform demolition of utilities requires submission of a formal request, through the UMA Resident Engineer. Refer to 015000 for the shutdown policy.

   1. Electrical shutdowns may require temporary power through generators, furnished and installed by the electrical sub-contractor, to power critical equipment identified by UMA. Refer to 015000 and Division 26 for information on service requirements. The general contractor shall coordinate with and support the electrical contractor as required.

D. Although the notification periods listed above should be sufficient for UMA to coordinate suspension of research, UMA reserves the right to postpone or deny shutdowns that would affect long-term experiments that were in progress prior to shutdown notification. No claims for delays will be entertained, and contractors shall reschedule accordingly.

E. All shutdown and/or work impacting occupied spaces/labs subject to the shutdown policy shall be appropriately noted in the construction schedule.

3.3 PREPARATION

A. Submit a demolition plan and schedule under the provisions of Section 013300 - Submittals, prior to performing any demolition work. Adjust schedule as required to accommodate ongoing research in occupied areas. In some cases, work after hours may be required.

B. File all appropriate paperwork and obtain all required permits prior to the start of demolition, including but not limited to:

   1. AQ-06 demolition permit.
   2. Dumpster permit.
   3. ANF-01 (Asbestos Notification, Refer to 020800)

C. Sequence work in occupied areas so as to minimize disruption, and to allow continued use of spaces.

D. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain. Specifically, contractors are alerted to the fact that the exterior walls are cast-in-place concrete bearing walls, and require shoring prior to any cutting or demolition. Refer also to 017329 - Cutting and Patching.

E. Cease operations and notify the Owner's Representative immediately if safety of structure...
appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

F. Areas to be renovated will be emptied of contents prior to the start of demolition. Where demolition of utilities and other items is required on other floors, the general contractors shall cover and protect furniture, equipment and fixtures from soiling or damage when demolition work is performed, remove said protection after the work is complete, and clean room to original condition prior to returning to occupants.

G. Erect and maintain dust-proof partitions and closures, and other means as required to prevent spread of dust or fumes to occupied portions of the building, as specified in Section 015000. Temporary partitions at corridors shall not restrict access of egress through the corridor, and shall not reduce the clear width to less than what is required by Code.

H. Coordinate temporary building HVAC shutdowns in the event dust-generating demolitions is to be performed adjacent to building air intake points. The general contractor shall provide temporary ventilation through fans, to control the spread of dust through the building and maintain a negative pressure in the project area, relative to the remainder of the building.

I. Extra care and precaution shall be taken by the GC to protect any live utilities from damage until such time as they can be demolished by the appropriate sub-trade. The GC will be responsible for any and all damages to lower floor finishes and equipment caused by leaks stemming from damage to any of the utilities within the project area.

3.4 DEMOLITION IN ACTIVE LABS

A. All demolition required in active labs adjacent to the project area, will be scheduled in advance with the UMA Resident Engineer. UMA reserves the right to deny or postpone demolition operations as required until experiments can be completed, and equipment moved. Refer to Section 015000 for the Shutdown Policy.

1. Demolition affecting network equipment will require special coordination with UMA personnel, and shutdown times and durations may be dictated by UMA.

B. Prior to demolition, all contractors involved in the work shall visit the lab areas with the UMA Resident Engineer, and identify for the researchers what equipment must be moved in order for the demolition to be performed.

1. Researchers will move or protect large pieces of sensitive major scientific equipment.

2. Contractors shall protect and work around smaller equipment, lab supplies and other such items.

3. Perform pre-demolition walk-thru and advise of equipment to be moved, a minimum of 7 days prior to scheduled work.
C. Demolition in active labs shall be performed as expeditiously as possible, and protective measures removed immediately after demolition has been completed. Do not schedule the start of demolition, unless it can be completed in an uninterrupted manner.

3.5 GENERAL 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.

B. Remove those components which do not contain hazardous materials, but which are in the way of abatement sub-contractors so that abatement can be performed.

C. Cut plaster in neat straight lines. Remove existing trim in such a manner as to allow new trim to abut existing trim with straight neat joints. Salvage trim where possible to permit re-installation.

D. When demolishing masonry, carefully remove materials leaving entire blocks suitable to tooth in new masonry as scheduled. Where cutting units is required, cut straight and neatly along existing mortar joints wherever possible.

E. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

F. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Designer in written, accurate detail. Pending receipt of directive from Designer, rearrange selective demolition schedule as necessary to continue overall job progress without delay.

G. Notify Architect immediately if materials scheduled to remain are found to be unsuitable for the installation of the new work, or if existing conditions deviate substantially from those shown on the drawings. Remove and replace, or make good, any existing materials unsuitable for installation of new work.

H. Sequence work in accordance with requirements of Section 013100. Schedule new work to coincide with demolition work, to minimize amount of disruption.

I. Demolition work shall include the removal of all cleats, clips, brackets, hangers, fasteners and every other accessory item no longer required for the Work in place. Such items which are normally associated with a sub trades work shall be removed by that trade.

1. Example: plumbers removing pipes shall also remove the pipe hangers.

3.6 FLOORING DEMOLITION
A. The extent of flooring demolition shall include removal of all materials unsuitable for the application of the new flooring. The contractor performing the demolition shall coordinate with the installer(s) as required, to understand the flooring manufacturer’s required substrate. Final prep of all floors with leveling compound, flashing compounds, etc. shall be performed by the trade installing the flooring.

B. Remove flooring, other than asbestos containing materials, carefully, to maintain the integrity of the substrate.

C. Fill all depressions already present in the room where construction removed by others, existing holes from damage or removal of utilities, damage left by shotblasting (if performed) and all other defects as required to deliver a level, uniform surface for the installation of finish flooring.

1. Filler material shall be non-shrink grout.

D. Fill any abandoned cores for utilities which are removed through this project, or any encountered abandoned utility cores with non-shrink grout.

E. Demolish existing metal wall base where new base is specified. Remove any clips that would inhibit the installation of new materials.

3.7 WALL DEMOLITION

A. Coordinate the removal of asbestos-containing wall materials with the abatement sub-contractor, and the erection of dust partitions after the removal of abatement containment walls.

B. Demolish walls and related doors and frames completely. Contractors are advised that framing extends from the floor to the underside of the floor above. All components shown to be demolished shall be removed entirely. Nothing is permitted to be abandoned above the new finished ceiling.

C. Where existing walls adjacent to those being demolished are scheduled to remain, the contractor is responsible for protecting those wall to minimize damage, and for all patching required to restore a smooth finished surface. Contractors may elect, at their own expense, to strip wall finishes entirely, and replace them with new wallboard, in areas where extensive repair is required.

3.8 CEILING DEMOLITION

A. All ceilings shall be removed and replaced by the General Contractor, where required to permit the performance of above ceiling work by MEP trades.

B. Coordinate ceiling demolition with electrical sub-contractor to either maintain and temporarily support existing light fixtures or to permit the installation of temporary lighting, until such time as the new permanent lighting can be installed.
C. Demolish existing ceilings completely where new ceilings are shown to be installed, including all framing channels, tracks and runners, hangers and brackets.

D. Salvage and stockpile all tiles removed from areas where new ceilings are not shown to be reinstalled, and reinstall tiles which are in the best condition. Allow UMA to retain any of the remaining tiles as they see fit, and dispose of the balance of tiles.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. All demolished materials may be conveyed to dumpsters at grade by carts through the building. Carts shall be covered at all times while being transported, and contractors shall sweep and damp mop dust and debris from transportation route at the end of each work day.

1. Contractors may utilize the building elevator, however, it shall be cleaned each day of use, and any repairs resulting from damage from construction operations shall be made expeditiously.

2. Follow the shortest route to the exterior. Transporting debris through finished portions of the building, particularly portions not receiving work, is discouraged and shall be minimized.

B. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site.

C. If hazardous materials beyond those identified for removal are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

D. Burning of removed materials is not permitted on project site.

3.10 DISPOSAL, CLEAN-UP AND REPAIR

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site.

1. The general contractor shall provide dumpsters for all project debris. One 30-yard dumpster will be permitted adjacent to the existing loading dock, where specifically identified by UMA. The dumpster shall not obstruct access to the dock for delivered, and shall be emptied in a timely manner.

2. Materials demolished by sub-trades shall be consolidated and neatly stacked within the room where they are removed. The general contractor shall transport all demolished materials to the dumpsters, and shall have any rights to salvage value of demolished materials.
B. Remove protections and leave interior areas broom clean. Where demolition was performed in occupied areas, all surfaces shall be vacuumed and wiped down free of dust.

C. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

D. Any damages to existing furnishings and/or equipment, shall be reimbursed by the general contractor, who shall recoup costs from other contractors as appropriate.

END OF SECTION
SECTION 061000

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Wood blocking, cants, and nailers.
2. Plywood backing panels.

B. Alternates: Refer to Section 01.23.00 – Alternates.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. None.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. None.

1.3 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. Include ICC-ES report indicating submitted product complies with the current Building Code.

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.

1.4 QUALITY ASSURANCE

A. Forest Certification: Provide rough carpentry produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC’s “Principles and Criteria for Forest Stewardship.”

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Plywood Panels:

1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Factory mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS
A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), 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 not containing arsenate.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete in exterior walls.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: For all interior use materials, provide materials that are fire-retardant treated and comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). 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.

B. 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 and ASTM D 5516, for plywood.

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 and ASTM D 5516, for plywood.

2. Use treatment that does not promote corrosion of metal fasteners.

3. Finished product shall meet ASTM E-84, having a flame spread rating of 25 or less, and bear a UL stamp for surface burning characteristics of a 30 minute ASTM E-84 test.

4. After initial treatment, FRT lumber shall have a moisture content of not over 28% when tested according to ASTM D-3201 at 92% relative humidity.

5. Kiln dry only after treatment to specified moisture content, and mark lumber KDAT.
2.4 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Cants.
4. Furring.
5. Grounds.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.

2.5 PANEL PRODUCTS

A. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch.

B. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.


C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and
inspecting agency.


2.7 MISCELLANEOUS MATERIALS

A. Adhesive, Including Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

   1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Apply field treatment complying with 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.

   1. When attaching to metal framing, use drywall type screws screwed through the metal framing and into the lumber.

   2. Attach blocking to concrete with Tap Con type fasteners or powder actuated fasteners, 12" on center, alternating between top and bottom of framing member. Minimum penetration 1½" into concrete.

   3. Attach blocking to hollow masonry using toggle-bolt fasteners.

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. All fasteners shall be coated as recommended by the preservative treatment manufacturer.
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.

1. Install continuous plywood blocking in all stud wall locations shown to receive display boards, shelving, or other wall-mounted items. Minimum width of 12” along fastening points, spanning continuously, stud-to-stud.

2. Lumber may be used in other locations.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. At exterior wall locations, blocking shall be installed prior to the installation of any vapor barriers specified or detailed.

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.

B. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.2 DESCRIPTION OF WORK

A. Work includes:
   1. Coat hooks.
   2. Corner guards.
   3. Plastic laminate countertops.

B. Alternates: not applicable.

C. Items To Be Installed only: None. No items are being furnished by others for installation by this Contractor.

D. Items To Be Furnished Only: None. All items furnished under this Section shall be installed by this Contractor.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

   1. Section 061000 - ROUGH CARPENTRY for blocking at locations to receive the work of this Section.

1.3 REFERENCES

A. ASTM E84
B. American National Standards Institute (ANSI)
C. American Society for Testing and Materials (ASTM)
D. National Electrical Manufacturers Association (NEMA)
E. International Solid Surface Fabricators Association (ISSFA)
F. National Sanitation Foundation (NSF)
1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire retardant requirements.
B. Conform to UL requirements to achieve fire resistance assembly rating indicated.

1.5 SUBMITTALS

A. General: Final color selections will be made by the Owner from the full range of colors available. No color selections will be made until all materials requiring color selection have been submitted. The designer shall prepare color boards from the samples submitted, for the Owner’s review. Plan adequate time for decisions, when making submittals.

B. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.

C. Samples: Submit samples of all materials requiring color selection.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

PART 2 - PRODUCTS

2.1 COAT HOOKS

A. Coat hooks shall be similar to Alno model A898 peg style towel hook

1. Size: 1" diameter, 2-1/4" projection
2. Material: cast metal
3. Finish: satin nickel
4. Fasteners: concealed

2.2 CORNER GUARDS

A. Koroseal “Korogard Extruded Corner Guard” model G875 or approved equal extruded vinyl acrylic corner guards meeting the following criteria:

1. Fire Rating: Class I fire rating, when tested to ASTM E 84.
2. Size: 3/4" x 3/4" x 0.078" thick.
3. Length: 3'- 6"
4. Profile: 90° angle.
5. Color: selected by Owner from full range available.
6. Texture: pebble grain finish.
7. Adhesive: manufacturer’s recommended field applied adhesive (tapes not acceptable).

2.3 PLASTIC LAMINATE COUNTERTOPS

A. Post-formed counters, comprised of:
   1. Substrate: particleboard, OSB or similar engineered sheet product, moisture resistant (MR) grade, 3/4” thick or nearest sanded equivalent.
   2. Finish: high-pressure decorative laminate
   3. Edge: bull nose
   4. Splash: integral, 4” tall backsplash, with separate field applied end splashes, scribed and coped.

B. High-pressure Plastic Laminate: NEMA LD 3, horizontal grade.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following
      (a) Abet Laminati, Inc
      (b) Formica Corporation
      (c) Lamin-Art, Inc.
      (d) Nevamar Company, LLC; Decorative Products Div.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and openings are ready to receive work and field measurements are as shown on shop drawings.

B. Verify that mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.

C. Beginning of installation means acceptance of existing conditions.

3.2 COORDINATION

A. Coordinate with trade installing blocking, to ensure blocking is present in locations to receive coat hooks.

3.3 COAT HOOKS
A. Coat hooks shall be installed directly over wall finish, not on a secondary mounting board. Coordinate final location of hooks with Owner, and ensure continuous blocking is installed at all mounting locations.

B. Where hooks are shown, install them 54" a.f.f., spaced 12" apart.

3.4 PLASTIC LAMINATE COUNTERTOPS

A. Set cleats or nailers as may be required, prior to installation of casework by other trades.

B. Install counters in locations as shown on approved shop drawings. Secure to cabinetry below.

C. Caulk perimeter, where counters abut walls or other surfaces.

3.5 CORNER PROTECTION

A. Install corner protection on all exposed drywall outside corners.

B. Corner protection shall start at the top of the vinyl cove base, and extend for the specified length. Do not cut or interrupt base. Do not install before base is installed.

C. Adhere corner guards to walls fully.

3.6 CLEANING, ADJUSTING AND PROTECTIONS

A. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to architect's satisfaction and invoice for the cost of repairs.

END OF SECTION
SECTION 072100

THERMAL INSULATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS
   A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK
   A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
      1. Interior vapor barrier.
      2. Thermal batt insulation at exterior walls.
   B. Alternates: Refer to Section 012300 – Alternates.
   C. Items To Be Installed Only: Not Applicable.
   D. Items To Be Furnished Only: Not Applicable.
   E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
      1. Section 220001 – PLUMBING for pipe insulation.
      2. Section 230001 - HVAC for mechanical insulation.

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE
   A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer’s written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 BATT INSULATION

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. CertainTeed.
2. Owens Corning.

B. Performance Characteristics:

1. Fiberglass batts complying with ASTM C 665, Type I and ASTM E136.
2. Type: unfaced.
3. 3 ½" thick minimum, or as noted on Drawings.

2.2 BLOWN INSULATION

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. Applegate Insulation.
2. Green Fiber.
3. CertainTeed.

B. Performance Characteristics:

1. Type: Blown cellulose fiber insulation meeting ASTM C-739.
2. Thickness: to fill cavity.
3. R-value: minimum R-3.5/inch calculated using ASTM C-518 at 4” thickness.

2.3 SPRAYED-FOAM INSULATION AT GAPS PROTECTED BY THERMAL BARRIERS

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. Great Stuff Pro by Dow.
2. SuperGreen Foam by Foam-Tech Div. of H.C. Fennell.
3. Pur Fill 1G by Todol Products.

B. Sprayed-Foam Insulation: Water-cure closed cell polyurethane containing no urea-formaldehyde and no CFCs.

2.4 VAPOR BARRIER
A. At walls receiving thermal batt insulation, 6 mil sheet polyethylene, fire-rated.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL
A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
C. Where voids between studs are too small to effectively install batt insulation, install sprayed-foam insulation with uniform full thickness and with density which will not displace adjacent materials.

3.4 BATT INSULATION
A. Friction fit batts between studs, and temporarily secure in place with strapping, wires or other means as required, to support insulation until finish can be applied.
B. Use continuous lengths of insulation, wherever possible. Where multiple lengths are required,
butt batts together to eliminate any joints.

C. Insulate all cavities at jack studs and other such framing, by loosely filling gaps with insulation material. Insulation of cavities which will be concealed through the process of framing, should be performed by the framing installers as that work progresses.

D. Cavities too small to receive batts shall be insulated with spray-foam insulation.

E. After approval of insulation installation by Authority Having Jurisdiction (AHJ), install a continuous vapor barrier over insulated surfaces, prior to installation of wall board. Tape all seams and cuts.

3.5 BLOWN INSULATION

A. Core walls at each stud bay, to permit filling entire wall.

   1. Where possible, limit coring to above-ceiling locations, and blow down to fill study bay. Where coring visible portions of walls is unavoidable, give priority to locations which will be concealed by casework, tackboards, whiteboards and the like.

   2. Where coring in concealed locations is not possible, align cores in a uniform manner and make the minimum sized core required to properly install the product.

B. Place insulation following manufacturer’s requirements and using manufacturer’s recommended equipment.

C. Fill stud cavities full.

D. Patch all visible cores using materials similar to the wall material which was cored. Finish drywall and plaster surfaces such that the patch is not visible, and as specified in Section 01.73.29 – Cutting and Patching.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Alternates: Refer to Section 012300 - Alternates.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 220001 - PLUMBING for piping penetrations.

2. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING for duct and piping penetrations.

3. Section 260001 - ELECTRICAL WORK for cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated. Resistant to the penetration of fire and other gases, and maintain original fire-resistance rating of construction penetrated.
B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated, as determined per ASTM E 814.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

D. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

E. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

F. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

2. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

   a. Types of penetrating items.
   b. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
   c. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

C. Qualification Date: For Installer.
1.5 QUALITY ASSURANCE

A. Installer Qualifications: Either a firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" or a firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction of a minimum of five projects with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestop tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.

2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:

   a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.

   b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed in the UL “Fire Resistance Directory.”

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Through-Penetration Firestop System Schedule at the end of Part 3.

1. BioFireshield; RectorSeal Corporation.
2. Hilti, Inc.
4. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING MATERIALS

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies indicated in the Through-Penetration Firestop System Schedule at the end of Part 3. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
2.3 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements.

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.
3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

1. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

2. Install fill materials for firestop systems by proven techniques to produce the following:
   a. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   b. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   c. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Independent Testing Agency: UMA may retain an Independent Testing Agency for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

B. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

C. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

D. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

E. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove
damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEM ASSEMBLIES

A. General: Install through-penetration firestop systems to comply with Part I "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for firestop systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.7 FIELD QUALITY CONTROL

A. Independent Testing Agency: WSU may retain an Independent Testing Agency for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

B. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

C. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

D. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

E. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.
A. Schedule: All firestopping installed shall maintain the ratings required for Type IB construction as defined in 780 CMR, the Massachusetts State Building Code, Eighth Edition. General requirements are as follows:

1. Exterior bearing/non-bearing walls................................................................. 0 Hour
2. Structural Frame ............................................................................................ 0 Hour
3. Exterior Bearing Walls ................................................................................. 0 Hour
4. Interior Bearing Walls ............................................................................... 0 Hour
5. Non-bearing Walls .................................................................................... 0 Hour
6. Floor Construction .................................................................................... 0 Hour
7. Roof Construction ..................................................................................... 0 Hour
8. Corridor walls ............................................................................................ 0 Hour
9. Stairhall/ elevator walls/shafts ................................................................. 1 hour if 3 stories or less, 2 hours if 4 stories or more
10. Gas cylinder alcoves in corridors.............................................................. 2 Hour

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<th>CONCRETE FLOORS</th>
<th>UL-CLASSIFIED SYSTEMS</th>
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* No UL-Classified system is available as of August 2003. Engineer Judgment Drawing Required.

NOTES:
1. Jobsite conditions of each through-penetration firestop system must meet all details of the UL-Classified System selected.
2. If jobsite conditions do not match any UL-classified systems in the schedules above, contact firestop manufacturer for alternative systems or Engineer Judgment Drawings.
3. Coordinate work with other trades to assure that penetration-opening sizes are appropriate for penetrant locations, and vice versa.
4. For 3-hour rated gypsum walls, contact the firestop manufacturer for a UL-classified system or engineer judgment drawing.

5. The Contractor shall verify that the schedule is current at the time of construction, and that each referenced system is suitable for the intended application.

END OF SECTION
 SECTION 081113
HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS
A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK
A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Standard hollow-metal steel frames.
B. Alternates: Refer to Section 012300 – Alternates.
C. Items To Be Installed Only: Not Applicable.
D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:
   1. None.
E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 081416 – FLUSH WOOD DOORS for doors to be installed in frames.
   2. Section 087100 - DOOR HARDWARE for door hardware incorporated into steel frames.
   3. Section 099000 - PAINTING AND COATING for field painting steel frames.

1.3 SUBMITTALS
A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, temperature-rise ratings, and finishes for each type of steel door and frame specified.
B. Shop Drawings:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Qualification Data: For Installer.

E. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

C. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.
1.6 Project Conditions

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 Coordination

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

Part 2 - Products

2.1 Manufacturers

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amweld International.
2. Ceco Door Products; an ASSA ABLOY Group Company.
3. CURRIES Company; an ASSA ABLOY Group Company.
4. Mesker Door Inc.
5. Pioneer Industries, Inc.
7. Steelcraft, an Ingersoll Rand Company.

2.2 Materials

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

D. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
2.3 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.
   1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
   2. Frames for Level 2 Steel Doors: 0.053-inch-thick (16 g.) steel sheet.

C. Hardware Reinforcement: Fabricate according to ANSI/SDIA250.6 with reinforcement plates from same material as frames.

2.4 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
   2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
   3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
   2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.5 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and not visible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

4. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
   b. Compression Type: Not less than two anchors in each jamb.
   c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

5. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section 087100 - DOOR HARDWARE.
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDIA250.8.
   2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
   3. Comply with applicable requirements in ANSI/SDIA250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
   4. Coordinate locations of conduit and wiring boxes for electrical connections with Section 260001 - ELECTRICAL WORK.

2.6 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. At fire-protection-rated openings, install frames according to NFPA 80.
   b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   c. Install door silencers in frames before grouting.
   d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   f. Field apply bituminous coating to backs of frames that are filled with grout.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.


4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

7. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION
SECTION 081416

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Solid-core doors with wood-veneer and medium-density overlay faces.
2. Factory finishing for wood doors to receive transparent finish.
3. Factory machining for hardware.
4. Shop-installed glass and glazing for the work of this Section.

B. Alternates: Refer to Section 012300 – Alternates.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 087100 - DOOR HARDWARE for hardware for wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings.

1. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door and matching transom; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors and transoms to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.

C. Samples for Verification:
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
   2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE
   A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
   B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
   C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Comply with requirements of referenced standard and manufacturer's written instructions.
   B. Package doors individually in plastic bags or cardboard cartons.
   C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS
   A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY
   A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors and transoms that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

FLUSH WOOD DOORS
081416 - 2
1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall include hardware installation and replacement of glass and glazing.
3. Warranty shall be in effect during the following period of time from date of Substantial Completion:

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flush Wood Doors:
   a. Algoma Hardwoods Inc.
   b. Eggers Industries; Architectural Door Division.
   c. Marshfield Door Systems.
   d. Oshkosh Door Company
   e. VT Industries Inc.

2.2 DOOR AND TRANSOM CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that contain no added urea formaldehyde.

B. Doors for Transparent Finish:

1. Grade: AWI Premium, with AWI Grade A faces.
2. Species and Cut: Face veneers shall be plain sliced White Birch (natural Birch is not acceptable).
4. Assembly of Veneer Leaves on Door Faces: Running match.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Transom Match: Continuous match.
7. Stiles: Manufacturer’s standard laminated stile construction with exposed surface the same species as faces.

2.3 SOLID-CORE DOORS

A. Cores: Comply with the following requirements:

1. Particle Core: ANSI A 208.1, Grade 1-LD-2, contributes to MR 4 and MR7.
2. Structural Composite Lumber Core: Timberstrand LSL, contributes to IEQ 4.4 and MR 7.
3. Provide doors with structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated or where light or louver cutouts exceed 40% of the door area.

B. Interior Veneer-Faced Doors:
1. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Fire-Rated Doors:
1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard fire-resistant composite core construction as needed to provide fire rating indicated.
   a. Fire Resistant Composite Core, with no added urea formaldehyde crossbands per IEQ 4.4.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

2.4 GLASS

A. Heat-Treated Float Glass for Non-Rated Doors: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

B. Glass for Rated Doors: Glass shall be UL Listed for use in fire-rated doors as scheduled, and shall be a minimum 1/4" thick.
1. Glass in rated doors shall be tested to NFPA 252 or UL10B/UL10C, marked minimum D-20.

C. Stops for glazing shall be hardwood, suitable for use in fire rated doors, rabbeted style with a ½" face and minimum 7/16" thickness. Edges shall be rounded or eased. Miter all corners.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining. Drill pilot holes for screws for butt hinges and lock fronts at the factory.

C. Glazed Openings: Glaze doors at factory with glass of type and thickness indicated. Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood stops.

2.6 FACTORY FINISHING

A. General: Comply with AWI/AWMAC/WI's "Architectural Woodwork Standards" for factory finishing.

B. Finish doors at factory that are indicated to receive transparent finish. Factory prime and prepare for field finish doors indicated to receive opaque finish.

C. Transparent Finish:

1. Grade: Premium.
3. Staining: To match existing doors adjacent to the project area.
4. Effect: Match existing.
5. Sheen: Match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 - DOOR HARDWARE.

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Protection: Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.

C. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION
PART - I  GENERAL

1.1 GENERAL PROVISIONS

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

B. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included:

1. Thermally-broken aluminum windows with insulated glazing units.

B. Alternates: not applicable

C. Items To Be Installed Only: Install the following items furnished by the designated sections:

1. Not applicable.

D. Items to be Furnished Only: Furnish the following items for installation by the designated sections:

1. None. All items furnished under the Section shall be installed by this Contractor.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 024119 - SELECTIVE DEMOLITION for creation of new openings to receive the Work of this Section.

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 windows comply with specified requirements. Product data for each type of window required, shall include:

1. Construction details and fabrication methods that illustrate the placement of any shop
or field applied components (gaskets, weeps, etc.) that are necessary to achieve required performance levels.
2. Profiles and dimensions of individual components.
3. Data on hardware, accessories, and finishes.
4. Recommendations for maintenance and cleaning of exterior surfaces.

B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others. Show all interfaces and relationships to work of other trades. Illustrate the new sashes with profiles to match existing sashes. Include information not fully detailed in manufacturer’s standard product data and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
4. Flashing and drainage details.
5. Weather-stripping details.
7. Glazing details.
8. Window cleaning provisions.
9. Illustration of water management and weep locations.

C. Certification: Provide certifications by a recognized independent testing laboratory or agency showing that each type, grade, and size of a window unit complies with performance requirement indicated.

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 the completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

F. Product test reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade and size of aluminum window. Test results based on use of down-sized test units will not be accepted.

G. Qualification data: For installer and Testing Agency.

H. Field Quality-Control test reports: From a qualified testing and inspecting agency engaged by the contractor.

I. Maintenance Data: For frames and finishes to include in maintenance manuals.


K. Safety Plan: submit a safety plan outlining OSHA compliance for installation of windows,
to the University CSO. Approval of the plan is required prior to the start of work.

1.4 QUALITY ASSURANCE

A. Source: For each 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 manufacturer of the primary materials.

B. Installer: A firm with a minimum of ten years experience in type of work required by this section and which is acceptable to the manufacturers of the primary materials.

C. Testing Agency Qualifications: Independent testing agency, acceptable to authorities having jurisdiction, with experience and capability to conduct testing indicated.

D. Indications of section sizes and reinforcement on the Drawings are for design intent only. Require manufacturer to provide proper structural design and anchorage.

E. Provide one full size replacement window mock-up for Architect’s review of site lines, colors, glazing, etc and obtain Architect’s approval of mock-up prior to ordering windows.

F. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum windows’ aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

G. Fenestration Standard: Comply with AAMA/NWWDA 101/I.S.2, “Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors,” for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

   1. Provide AAMA certified aluminum windows with an attached label.

H. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA’s “Glazing Manual” unless more stringent requirements are indicated.

I. Mockups: Not Required.

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to aluminum windows including, but not limited to, the following:

   1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.

   2. Review and finalize construction schedule and verify availability of materials, Installer’s personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing and inspecting procedures.

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer’s windows that are representative of those specified and that are of test size indicated below:


B. AAMA/NWWDA Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with AAMA/NWWDA 101/I.S.2.

1. Performance Class: Architectural Grade AW90.
2. Performance Grade: Minimum for performance class indicated.
3. Exception to AAMA/NWWDA 101/I.S.2: In addition to requirements for performance class and performance grade, design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch whichever is less, at design pressure based on structural computations.

C. Structural Performance: Provide aluminum windows capable of withstanding the following, including window loads based on passing AAMA/NWWDA 101/I.S.2, Uniform Load Structural Test, at basic wind speed indicated and as required by Code:

1. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length of 3/4 inch, whichever is less, at design pressure based on structural computations.
2. Wind and Seismic Loads: As indicated on the Structural Drawings, but not less than that required by Code.
3. Movements of supporting structure including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads as required by Code. Deflection may require special considerations including by not limited to head receptors.

D. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/NWWDA 101/I.S.2, Air Infiltration Test.

1. Maximum Rate: As specified herein under Part 2.

E. Water Resistance: no water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/NWWDA 101/I.S.2, Water Resistance Test.

1. Test Pressure: 15 PSF
F. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52 where windows are indicated to be “thermally improved.”

G. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior window velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-Value: As required by Code. Submit proof of compliance with submittals as specified.

H. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

1.6 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.

1.7 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.

1.8 WARRANTIES

A. Window Contractor’s Warranty: The subcontractor shall supply Owner with a minimum five-year workmanship warranty for each window. In the event any work related to the windows is found to be defective within five years of substantial completion, the window contractor shall remove and replace such at no additional cost to the Owner. The window subcontractor’s warranty obligation shall run directly to the Owner, and a copy of the signed warranty shall be sent to the window manufacturer.

1. The duration of the Window Contractor’s five-year warranty shall run concurrent with the window system’s manufacturer’s 10-year warranty.
B. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures included, but are not limited to, the following:

1. Failure to meet performance requirements.
2. Structural failures including excessive deflection.
3. Water leakage, air infiltration, or condensation.
4. Faulty operation of movable sash and hardware.
5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Aluminum Windows and Related Materials: Provide a written warranty, signed by the manufacturer agreeing to repair or replace work which exhibits defects in materials or workmanship, including all extrusions, weatherstripping, panning, and trim, and all hardware. 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 windows and connected adjacent work.

1. Warranty Period: Ten years from date of Substantial Completion.

D. Finish Warranty: Provide a written warranty, signed by the manufacturer agreeing to repair or replace metal finishes which have deteriorated from chalking, fading, cracking, peeling, and chipping.

1. Warranty Period: Ten years from date of Substantial Completion.

E. Warranty Period for Insulating Glass Units: Manufacturer’s written warranty agreeing to furnish replacement for defects identified within 10 years from date of Substantial Completion (excluding that due to glass breakage). Defects are defined to include intrusion of moisture or dirt, internal condensation at temperatures above -20 deg F, deterioration of internal glass coating, and other visual evidence of seal failure or performance failure.

PART - II  PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide products of one of the following, that meet or exceed requirements specified:

1. EFCO, a Pella Company.
2. Kawneer Company

2.2 SYSTEMS

A. Provide replacement fixed windows in new sub frames meeting AAMA 101 FW-AW90 Grade for use in existing openings. Sash profile to match window profile of existing sashes. Product performance requirements should equal or exceed performance criteria:

1. Air Infiltration: 0.1 CFM/sqft at 6.24psf.
3. Thermal Transmittance: U-Factor 0.34 per AAMA 1503.
5. Sash Profile: Provide custom profiles to match existing windows.

2.3 MATERIALS AND PRODUCTS

A. Aluminum Extrusions: Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application indicated, but not less than 0.125 in. thickness at any locations.

B. Aluminum Sheet: Provide aluminum sheet 5005 H32 (anodic) or 3003 H14, as recommended by manufacturer for strength, corrosion resistance, and application indicated.

C. Fasteners: Comply with referenced standards. Provide non-magnetic stainless steel fasteners. Provide concealed fasteners to the greatest extend possible. Provide Phillips flathead screws for exposed fasteners.

D. Weatherstripping: Provide closed cell extruded sponge neoprene meeting ASTM C 509.

E. Glazing Gaskets: Provide preshimmed butyl tape and dense neoprene wedge meeting ASTM C 509, with silicone cap bead on inner access panel.

F. Thermal Break: Provide factory poured-in-place polyurethane into prefinished cavity in manufacturer’s plant providing a minimum 3/8 in. separation.

1. Non-structural thermal barriers will not be acceptable.

G. Sealant: Tremco “Spectrum 2" High Performance Silicone Sealant or approved equal meeting ASTM C 920, Type S, Grade NS, Class 50.

H. Anchors: Window Manufacturer must apply at the factory extruded aluminum slide-in type anchors.

I. Sub-Frames and Panning: Provide custom aluminum panning and sub-frames to match existing windows.

J. Insulating Glass: 1 in. insulating units with 1.2 inch air space, and low-e coating on No. 2 surface. Tempered as required. Provide Solarban 70 as manufactured by PPG, or approved equal.
2.4 FABRICATION

A. General: Fabricate aluminum windows, in sizes indicated, that comply with AAMA/NWWDA 101/1.S.2 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062 inch thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

F. Factory-Glazed Fabrication: Glaze aluminum windows in factory where practical and possible for applications indicated. Comply with AAMA/NWWDA 101/1.S.2.

G. Aluminum Brake Metal: Provide all aluminum brake metal work in conjunction with aluminum windows. Fabricate brake-metal work from minimum 0.062 inch thick aluminum sheet, finished to match windows.

2.5 FINISH

A. Painted Finish: AAMA 2605, PPG Duranar, Kawneer Permadize or Valspar Fluoropon, minimum 70% Kynar resin, 2-coat minimum, custom color and gloss as selected by the Architect.

B. Provide windows with dual finish. Exterior and interior custom colors shall match and compliment existing colors.
   1. Color to be selected by Owner, to match the existing windows (generally a medium bronze).
   2. Exterior and interior colors to be the same.

PART - III PART 3 – EXECUTION

3.1 INSPECTION

A. The Installer/Erector shall examine substrates, supports, and conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Unsatisfactory conditions should be documented and reported by the
contractor to the Architect. Beginning of installation will be construed as installer accepting substrates and conditions.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

B. Remove and replace windows where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.3 INSTALLATION

A. General Installation Requirements: Strictly comply with shop drawings, architectural drawings, and manufacturer’s instructions and recommendations, except where more restrictive requirements are specified in this section.

B. Installation: Install window units plumb, level, in alignment and place without warp or rack. Anchor securely in place. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.


D. Sealants: Install sills and subframes in a thick bed of sealant.

E. Flashing: Coordinate with flashing installation to ensure weather tight construction and assembly. Thoroughly seal all penetrations through flashings with a thick bed of sealant.

3.4 TOLERANCES

A. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Documents. Do not add these tolerances to any allowable tolerances indicated for other work.

1. Allowable Variation from True Plumb, Line and Level: ± 1/8 in. in 200 ft.-0 in.
2. (New E) All elastomeric coating finishing noted in section 01 7329 to be completed after installation of window sub-frames and before fixed windows are installed.

3.5 ADJUSTING, CLEANING TOUCH-UP, AND PROTECTION

A. Clean exposed surfaces using manufacturer recommended materials and methods. Remove and replace work which cannot be successfully cleaned.

B. Touch-up damaged coatings and finishes. Eliminate all visible evidence of repair.
C. Provide temporary protection at all times during the course of the work, and immediately after completion to ensure the 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.

END OF SECTION
SECTIONS 087100

DOOR HARDWARE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Commercial door hardware.
2. Cylinders for doors specified in other Sections as listed below.

B. Alternates: Refer to Section 01.23.00 – Alternates.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. None.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. SECTION 123553 – LABORATORY CASEWORK for locks associated with cabinetry to be provided by the casework supplier.

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Not required

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the
final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
   a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.

3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Keying Schedule: Not required. University Lock Shop will provide all keying information. Contractor shall supply and install Best cores. The Contractor shall coordinate with UMA PM and the Lock Shop accordingly.

E. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
   1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
   1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.

G. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.

H. Warranties: Special warranties specified in this Section.
I. Fire Door Assembly Inspection and Testing Reports: Submit a written report of the results of functional testing and inspection for fire door assemblies, in compliance with NFPA 80-2007/2010 requirements. Written report shall be provided to the UMA Project Manager to be made available to the Authority Having Jurisdiction (AHJ). Report shall include the door number for each fire door assembly, door location, door and frame material, fire rating, and summary of deficiencies.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Designer, and the UMA Project Manager about door hardware and keying.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Massachusetts Architectural Access Board and the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:
   a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
   b. Door Closers: Comply with the following maximum opening-force requirements indicated:
      1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
      2) Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
      3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
   c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

2. Requirements of 521 CMR 20.8.1 and NFPA 101: Comply with the following for means of egress doors:
a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch.
   Locks shall not require the use of a key, tool, or special knowledge for operation.

b. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 15 lbf for not more than 3 seconds.

c. Door Closers: Not more than 15 lbf to open door to minimum required width.

d. Thresholds: Not more than 1/2 inch high.

F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252.

G. Keying Conference: Vendor to coordinate with Lock Shop.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver keys to manufacturer of key control system.

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive the UMA Project Manager of other rights the UMA Project Manager may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of operators and door hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

D. Warranty Period for Manual Closers: Ten years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the facility’s continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Scheduled and acceptable manufacturers 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 Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinges</td>
<td>Ives (IVE)</td>
<td>McKinney, Hager, Stanley</td>
</tr>
<tr>
<td>Locksets &amp; Deadlocks</td>
<td>Schlage (SCH)</td>
<td>Sargent, Best</td>
</tr>
<tr>
<td>Cylinders &amp; Keying</td>
<td>Best – No Substitutions</td>
<td>User Standard</td>
</tr>
<tr>
<td>Core</td>
<td>Furn./inst. by Contractor</td>
<td>Best 7-pin WB keyway</td>
</tr>
<tr>
<td>Door Closers</td>
<td>LCN (LCN)</td>
<td>Sargent</td>
</tr>
<tr>
<td>Flush Bolts &amp; Coordinators</td>
<td>Ives (IVE)</td>
<td>Rockwood, Burns</td>
</tr>
<tr>
<td>Kick Plates</td>
<td>Ives (IVE)</td>
<td>Rockwood, Burns</td>
</tr>
<tr>
<td>Stops &amp; Holders</td>
<td>Ives (IVE)</td>
<td>Rockwood, Burns</td>
</tr>
<tr>
<td>Overhead Stops</td>
<td>Glynn-Johnson (GLY)</td>
<td>Sargent, Rixson</td>
</tr>
<tr>
<td>Silencers</td>
<td>Ives (IVE)</td>
<td>Rockwood, Burns</td>
</tr>
<tr>
<td>Thresholds &amp; Weatherstrip</td>
<td>National Guard (NGP)</td>
<td>Pemko, Reese</td>
</tr>
</tbody>
</table>

B. 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.

C. 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.
4. All hardware shall be installed with the fasteners provided by the hardware manufacturer.

B. Hinges:

1. The following is a guide for hinge type required for this specification:
   a. Interior 1-3/4" thick doors up to and including 3'-0" wide: standard weight, ball bearing, steel, 4-1/2" high
   b. Interior 1-3/4" thick doors over 3'-0" wide: heavy weight, ball bearing, steel, 5" high
2. Provide 3 hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Interior Doors: Non-rising pins
4. The width of hinges shall be 4-1/2" or as required for clearance.

C. Flush Bolts:

1. The inactive leaf of pairs of doors not required for egress purposes but required to have a fire rating, shall be equipped with automatic flush bolts and dust proof strikes. Acceptable products:
   a. Ives 556/356
   b. Glynn Johnson FB8/FB10
   c. Rockwood 1942/1945

D. Coordinators:
1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide a bar-type coordinating device, surface applied to the underside of the stop at the frame head.

2. Finish of the coordinator to be prime coat to receive the same finish paint as the doorframe.

3. Provide a filler bar of the correct length for the unit to span the entire width of the opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

4. Acceptable products:
   a. Ives 900 Series
   b. Glyn Johnson GCCor Series
   c. D.C.I. 600 Series

E. Mortise Locks:
   1. Mortise locks shall be certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and shall be 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.
   2. Locks are to have a standard 2-3/4" backset with a full 3/4" throw 2-piece stainless steel mechanical anti-friction latch bolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.
   3. Lever trim shall match the appearance of other new hardware recently installed within the building and 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. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
   4. Locks meeting this specification: Schlage L9000 series, Sargent 8200 series, Best 40H series, and Corbin Russwin ML2000 Series.

F. Kick Plates: Provide 0.050" thick stainless steel kick plates as scheduled, with 4 beveled edges. Furnish with machine or wood screws, finished to match plates. Plates shall be 8" high x 2" LWOD on single doors, 1" LWOD on pairs of doors.

G. Door Stops and Holders:
   1. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements:
      a. Wall stops shall be used wherever possible.
      b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
      c. At any opening where a wall or floor stop cannot be used, a heavy-duty overhead stop must be used.

H. Thresholds: Furnish as scheduled and per architectural details. Match finish of other items as closely as possible. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available.
I. Silencers: "Push-in" type silencers for each hollow metal frame, three for each single frame, two for each pair frame. Omit where gasketing is scheduled.

2.3 FINISHES

A. With the exception of all items listed below, the finish of all hardware shall be US26D - satin chrome or US32D - satin stainless steel. Exceptions are as follows:

1. Door Closers: Aluminum powder coat finish.
2. Coordinators: Prime painted.
5. Silencers: Grey.

2.4 KEYING

A. The Contractor shall provide construction cores for the Contractor’s use. Existing cores shall be removed by the University.

B. Permanent cores will be furnished by the Contractor and installed by the Contractor. Construction cores will be removed and retained by the Contractor at the time of change.

C. The Hardware Supplier shall furnish to the University 5 blank keys per lockset installed, uncut and suitable for use with the University’s standard core system (Best 7-pin WB IC).

D. Keying is by the Contractor. The University Lock Shop will provide all keying info.

E. All cores and master keys shall be delivered directly to the UMA Project Manager by the hardware supplier, who shall obtain an itemized transmittal for delivery of same.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Wood Doors: Comply with DHI A115-W series.
B. Where on-site modification of doors and frames is required, prepare hardware locations in accordance with the following:

1. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

2. Where doors are in rated assemblies, comply with NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:


2. 521CMR – Massachusetts Architectural Access Board

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.

2. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct the UMA Project Manager's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items as necessary to restore proper function and finish.

3.6 HARDWARE SCHEDULE

A. The following listings are of typical openings. Openings not included shall have the same hardware as that of a similar opening.
B. Determination of final quantities required is the responsibility of the contractor.

Hardware Set 1A (double doors, corridor-lab)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge</td>
<td>3</td>
<td>5BB1 4 ½ X 4 ½ (ACTIVE)</td>
<td>652 IVES</td>
</tr>
<tr>
<td>Hinge</td>
<td>1</td>
<td>5BB1 4 ½ X 4 ½ (INACTIVE)</td>
<td>652 IVES</td>
</tr>
<tr>
<td>Hinge</td>
<td>2</td>
<td>3SP1 4 ½ X 4 ½ (INACTIVE)</td>
<td>652 IVES</td>
</tr>
<tr>
<td>Auto Bolts</td>
<td>1</td>
<td>FB52</td>
<td>32D IVES</td>
</tr>
<tr>
<td>Strike</td>
<td>1</td>
<td>DP2</td>
<td>26D IVES</td>
</tr>
<tr>
<td>Lockset</td>
<td>1</td>
<td>9070HD X 06A, classroom</td>
<td>626 SCHLAGE</td>
</tr>
<tr>
<td>Closer</td>
<td>1</td>
<td>4011 MC</td>
<td>AL LCN</td>
</tr>
<tr>
<td>Astragal</td>
<td>1</td>
<td>Wood, full length</td>
<td></td>
</tr>
<tr>
<td>Coordinator</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kickplates</td>
<td>2</td>
<td>8&quot; X 2&quot; LTDW</td>
<td>32D IVES</td>
</tr>
<tr>
<td>Door Stops</td>
<td>2</td>
<td>TO SUIT</td>
<td>26D IVES</td>
</tr>
<tr>
<td>Door Silencer</td>
<td>3</td>
<td>SR64</td>
<td>GRY IVES</td>
</tr>
</tbody>
</table>

Hardware Set 1B (double doors, lab-lab)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge</td>
<td>6</td>
<td>5BB1 4 ½ X 4 ½ (ACTIVE)</td>
<td>652 IVES</td>
</tr>
<tr>
<td>Manual Flt Bolts</td>
<td>1</td>
<td></td>
<td>32D IVES</td>
</tr>
<tr>
<td>Strike</td>
<td>1</td>
<td>DP2</td>
<td>26D IVES</td>
</tr>
<tr>
<td>Lockset</td>
<td>1</td>
<td>9070HD X 06A, classroom</td>
<td>626 SCHLAGE</td>
</tr>
<tr>
<td>Kickplates</td>
<td>2</td>
<td>8&quot; X 2&quot; LTDW</td>
<td>32D IVES</td>
</tr>
<tr>
<td>Door Stops</td>
<td>2</td>
<td>TO SUIT</td>
<td>26D IVES</td>
</tr>
<tr>
<td>Door Silencer</td>
<td>3</td>
<td>SR64</td>
<td>GRY IVES</td>
</tr>
</tbody>
</table>

Hardware Set 2A (single door, corridor - lab)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge</td>
<td>3</td>
<td>5BB1 4 1/2 X 4 1/2</td>
<td>652 IVES</td>
</tr>
<tr>
<td>Lockset</td>
<td>1</td>
<td>L9070HD X 06A, classroom</td>
<td>626 SCHLAGE</td>
</tr>
<tr>
<td>Closer</td>
<td>1</td>
<td>4011 MC</td>
<td>AL LCN</td>
</tr>
</tbody>
</table>
1 EA KICKPLATE 8" X 2" LTDW 32D IVES
1 EA DOOR STOP TO SUIT 26D IVES
3 EA DOOR SILENCER SR64 GRY IVES

**Hardware Set 2B** (single door, lab-lab)

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Model</th>
<th>Color</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE 5BB1 4 1/2 X 4 1/2</td>
<td>652</td>
<td>IVES</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LOCKSET L9070HD X 06A, classroom</td>
<td>626</td>
<td>SCHLAGE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICKPLATE 8&quot; X 2&quot; LTDW</td>
<td>32D</td>
<td>IVES</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR STOP TO SUIT</td>
<td>26D</td>
<td>IVES</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>DOOR SILENCER SR64</td>
<td>GRY</td>
<td>IVES</td>
<td></td>
</tr>
</tbody>
</table>

**Hardware Set 3** (Corridor to cylinder alcove, single door)

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Description</th>
<th>Model</th>
<th>Color</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HINGE 5BB1 4 ½ X 4 ½</td>
<td>652</td>
<td>IVES</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>HINGE 3SP1 4 ½ X 4 ½</td>
<td>652</td>
<td>IVES</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>LOCKSET 9060HD X 06A, storeroom</td>
<td>626</td>
<td>SCHLAGE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICKPLATES 8&quot; X 2&quot; LTDW</td>
<td>32D</td>
<td>IVES</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR STOPS TO SUIT</td>
<td>26D</td>
<td>IVES</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>DOOR SILENCER SR64</td>
<td>GRY</td>
<td>IVES</td>
<td></td>
</tr>
</tbody>
</table>

**Hardware Set 5**

Salvage existing hardware (except hinges) and reinstall on new door. Replace hinges with new.

C. Doors shown swinging against electrical panels shall include an interior locking function as required by the electrical code, to allow electricians servicing panels to lock the door from the room side.

D. Existing hardware on doors scheduled for demolition shall be removed from the door, salvaged and delivered to the Owner.

E. Clean operating items as necessary to restore proper function and finish.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Interior gypsum wallboard.

B. Alternates: Refer to Section 012300 – Alternates.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 220001 - PLUMBING:
   a. Access doors in gypsum board assemblies.

2. Section 230001 - HEATING, VENTILATING, AND AIR CONDITIONING:
   a. Access doors in gypsum board assemblies.
   b. Pipe and duct sleeves for placement into gypsum board openings.

3. Section 260001 - ELECTRICAL WORK:
   a. Access doors in gypsum board assemblies.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. None.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide fire stop tracks capable of withstanding deflection within limits and under conditions indicated.
1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples: Not required.
C. Shop Drawings: Not required.

1.5 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
B. Marking and Identification for Fire- and Smoke-Partitions: Fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions and other walls required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
   1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
   2. Be repeated at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
   3. Include lettering not less than 0.5 inch in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS," or other wording.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
   1. Deliver and store materials in accordance with Gypsum Association Publications GA-216, GA-238 and GA-801.
B. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
B. Do not install interior products until installation areas are enclosed and conditioned.
C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

D. Climatize sound attenuation boards to existing interior moisture conditions for a minimum of 24 hours before installation, or as required by manufacturer.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.2 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch.
2. Depth: as noted.

B. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0312 inch.

C. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch.
2. Depth: 7/8 inches.

E. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
2.3 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. USG Corporation.
   b. Georgia Pacific Gypsum.
   c. Lafarge North America.

B. Interior Wallboard: All wallboard to be used on this project shall be Fire-Resistant Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

C. Accessories:

1. Screws: 22-25g steel drywall screws.
3. Acoustical Sealant: ASTM C834, latex, gun grade

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
   a. Cornerbead.
   b. Bullnose bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. Expansion (control) joint.
   e. Curved-Edge Cornerbead: With notched or flexible flanges.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is
compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.

4. Finish Coat: For third coat, use setting-type, sandable topping compound.

5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

2.7 IDENTIFICATION LABELS FOR FIRE- AND SMOKE-PARTITIONS

A. Identification Labels: Vinyl adhesive signs, to comply with applicable local Code.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fire Wall Signs, Inc.
   b. Safety Supply Warehouse.

2. Text: "FIRE AND SMOKE BARRIER – PROTECT ALL OPENINGS"

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
C. Confirm that the spacing of all framing members is suitable for attachment of panels, that all stud cavities to receive sound attenuation board have been filled with acoustical insulation, and that all blocking for wall mounted items has been installed before proceeding with installation of board materials.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754. Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.

   a. Install two studs at each jamb, unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required
3.4 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Extend gypsum board to underside of structural deck on both sides of wall, and finish joint following specified procedures. This includes portions of corridor walls on office side, where no interior work is being performed, and at existing corridor walls where ceilings are demolished, even if the wall is not receiving any other work.

1. Coordinate the temporary detachment and reattachment of above-ceiling utilities which have been attached to bare framing requiring gypsum board installation.

2. Remove and reinstall existing above-ceiling items as may be required to extend gypsum board to underside of deck.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural
abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. At penetrations, extend drywall as close to the penetrating element as possible, to minimize the annular space.

1. Firestop annular spaces in rated assemblies as specified in Section 078413.
2. Fill annular spaces of non fire-rated assemblies with joint compound, to inhibit the passage of smoke.
3. Close off openings at tops of corridor walls, whether new or existing

I. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.5 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On partitions/walls, apply gypsum panels to minimize end joints.
2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.6 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Designer for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. Curved-Edge Cornerbead: Use at curved openings.
3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
   1. GA Level 1: Ceiling plenum areas and concealed areas not exposed to view.
   2. GA Level 2: Panels that are substrate for tile.
   3. GA Level 3: Not used.
   4. GA Level 4: Panel surfaces that will be exposed to view (typical panels).
   5. GA Level 5: Where indicated on Drawings.

3.8 INSTALLING IDENTIFICATION FOR FIRE- AND SMOKE-PARTITIONS

A. Marking and Identification for Fire- and Smoke-Partitions: Permanently install as required by Code.

3.9 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or exhibit mold growth. Repair of damaged panels in place is not acceptable.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION
SECTION 095113

ACOUSTICAL PANEL CEILINGS
(filed sub-bid required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the University of Massachusetts at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert legal name of sub-bidder)

U.M.A Project: U.M.A 17-10

U.M.A. PROJECT: Morrill I and IV North 1st and 3rd Floor Microbiology Consolidation

SUB-BID FOR SECTION: 095113 – Acoustical Panel Ceilings

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the Commonwealth of Massachusetts General Laws, as amended. Sub-bid forms may be obtained at the Procurement website: http://www.umass.edu/procurement/constructionprojects.htm.

3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the University of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

B. Sub Sub-Bid Requirements: (None required under this Section.)
ACOUSTICAL PANEL CEILINGS

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C. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings: A1.0, A2.0, A.2.1, A3.0, A3.1, A4.0, A4.1, A5.0, A5.1, A7.0, A9.0, A9.1 and referenced details.

1.3 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. Removing and reinstalling existing ceiling tiles.
2. New acoustical ceiling tiles.
3. New suspension systems, grid systems and ceiling hangers.

B. Alternates: Refer to Section 012300 – ALTERNATES.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. None.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING for air handling and distribution components located in ceilings.
2. Section 260001 - ELECTRICAL WORK for light fixture and alarm system components located in ceilings.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6 inch square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.

C. Asbestos Certification: Manufacturer's written certification that acoustical ceiling products contain no asbestos (0.0000%). Product labels indicating that it is the user's responsibility to test the products for asbestos are unacceptable and sufficient cause for rejection of the product on site.
D. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations:
   1. Acoustical Ceiling Panels: Obtain each type through one source from a single manufacturer.
   2. Suspension Systems: Obtain each type through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
   1. Surface-Burning Characteristics: Provide acoustical panels complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

C. Mockups: not required.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Products: Subject to compliance with specified requirements, provide one of the following products for each type indicated.

B. Standard Acoustic Tile Ceilings:

1. Armstrong “Fine Fissured” 1732.

2. Products matching the appearance of the installed tiles manufactured by Certainteed or United States Gypsum meeting the following criteria will be acceptable:

   a. Size: 24” x 24” x 5/8”
   c. Rating: non-fire rated, Class A
   d. Edge: tegular
   e. NRC: 0.55
   f. Reflectance” 0.85

2.2 METAL SUSPENSION SYSTEMS

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

   1. Manufacturer: USG, Armstrong, CertainTeed, or Chicago Metallic.
   3. End Condition of Cross Runners: Override (stepped) or butt-edge type.
   5. Cap Material: Steel or aluminum cold-rolled sheet.
   7. Grid Face Width: 15/16”.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

   1. Anchors in Concrete: Anchors with holes or loops for attaching hangers of type indicated
and with capability to sustain, without failure, a load equal to five times that imposed by
ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as
applicable, conducted by a qualified testing and inspecting agency; zinc-plated for Class
SC1 service.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application
indicated, fabricated from corrosion-resistant materials, with clips or other accessory
devices for attaching hangers of type indicated, and with capability to sustain, without
failure, a load equal to 10 times that imposed by ceiling construction, as determined by
testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft
temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635,
Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than
0.106 diameter wire.

2.3 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: L-profile, formed from sheet metal of
same material, finish, and color as that used for exposed flanges of suspension system runners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical
panel ceilings attach or abut, with Installer present, for compliance with requirements specified
in this and other Sections that affect ceiling installation and anchorage and with requirements
for installation tolerances and other conditions affecting performance of acoustical panel
ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EXISTING CEILINGS

A. Remove existing ceilings in areas where indicated on Drawings, to permit the above ceiling
work by other trades.

1. The contractor shall figure removal and reinstallation of 10% more than the areas shown
on the Drawings, to be performed where directed in the field.

2. The contractor shall figure the installation of new tile for 5% of the ceilings shown to be
reinstalled, due to damage during the performance of the Work.

B. Salvage all removed tiles for reinstallation. Store where directed within the building.

C. Upon completion of all above-ceiling work and all required inspections, reinstall ceiling tiles to original condition.

3.3 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.4 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. The layout and installation of acoustical panel ceilings and suspension systems shall be coordinated with other work penetrating the ceiling. This includes, but is not limited to, light fixtures, HVAC diffusers and equipment, and fire suppression system components.

2. Acoustical panels shall be cut and fit around light fixtures, HVAC diffusers and equipment and fire suppression system components to set flush or recessed as recommended by manufacturer.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or
power-actuated fasteners that extend through forms into concrete.

6. Do not attach hangers to steel deck tabs.

7. Space hangers not more than 48 o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

2. Where tegular-edged tiles are required to be field cut at room perimeter, rabbet cut edges such that the tile lays flat on the perimeter wall angle with the angle supporting the tees.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION
SECTION 096500

RESILIENT FLOORING
(filed sub-bid required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the University of Massachusetts at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert legal name of sub-bidder)

U.M.A Project: U.M.A 17-10

U.M.A. PROJECT: Morrill I and IV North 1st and 3rd Floor Microbiology Consolidation

SUB-BID FOR SECTION: SUB-BID FOR SECTION: 096500 – Resilient Flooring

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the Commonwealth of Massachusetts General Laws, as amended. Sub-bid forms may be obtained at the Procurement website: http://www.umass.edu/procurement/constructionprojects.htm.

3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the University of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

B. Sub Sub-Bid Requirements: (None required under this Section.)
C. Reference Drawings: The Work of this Field Sub-Bid is shown on the following Contract Drawings: A1.0, A2.0, A.2.1, A3.0, A3.1, A4.0, A4.1, A5.0, A5.1, A7.0, A9.0, A9.1 and referenced details.

1.3 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. Vinyl composition tile.
2. Resilient wall base and accessories.

B. Alternates: Refer to Section 012300 – ALTERNATES.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

2. Section 020800 – ASBESTOS ABATEMENT for removal of asbestos-containing-materials (ACM) and related mastics.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Full-size units of each color and pattern of resilient flooring required.

1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.

C. Shop Drawings: Indicate patterns for installation, including locations.

D. Maintenance Data: For resilient products to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.7 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive flooring during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION TILE

A. Vinyl Composition Tile (VCT): ASTM F 1066.

1. Armstrong World Industries, Inc.
3. Congoleum Corporation.
4. Tarkett Inc.

B. Characteristics:
1. Style and Colors: Excelon Imperial Texture, color to be selected by Owner. Project areas will receive two colors of tiles, in a random pattern consisting of 75% ‘color A’ and 25% ‘color B’.

2. Thickness: 0.125 inch.

3. Size: 12 by 12 inches.

2.2 WALL BASE

A. Wall Base: ASTM F 1861.

1. Armstrong World Industries, Inc.
5. Roppe Corporation.

B. Characteristics:

1. Style and Colors: Corridors: black. Rooms: Color to be selected by Owner
2. Type (Material Requirement): vinyl.
3. Shape: Straight (toeless) at carpet and coved at resilient flooring.
4. Minimum Thickness: 0.125 inch.
5. Height: 6 inches.
6. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
7. Outside Corners: Premolded.
8. Inside Corners: Premolded.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. VCT and Asphalt Tile Adhesives: 50 g/L.
   b. Cove Base Adhesives: 50 g/L.

2. Where cove base is to be adhered to metal casework, use adhesives specifically intended for non-porous surfaces.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. The flooring contractor shall be responsible for filling all small damaged areas with manufacturer’s recommended sub floor filler. Large depressions or areas of damaged caused by shot blasting or selective demolition shall be repaired by the General Contractor.

1. “Small damage” shall be defined as areas depressed or out of level for a depth of 1/4" or less.
2. Remove any sub-floor ridges and bumps.

B. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

C. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Test for concrete deficiencies and contaminates such as un-reacted silicates, chlorides, A.S.R. (alkali-silica reaction); as recommended by manufacturer.

D. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.
G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

H. Proceed with installation only after unsatisfactory conditions have been corrected. Installation of resilient flooring indicates acceptance of surfaces and conditions.

3.3 TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, doorframes, thresholds, and nosings.

D. Where resilient flooring is scheduled for a room, the entire floor area of the room shall receive flooring prior to the installation of any casework or other built-ins. Extend tiles into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

3.5 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.
4. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
   a. Coordinate selection of floor polish with the UMA Project Manager's maintenance service.

2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.

3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION
SECTION 099000

PAINTING AND COATING

PART 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  Time, Manner and Requirements for Submitting Sub-Bids:

1.  Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the University of Massachusetts at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

   The following should appear on the upper left hand corner of the envelope:

   NAME OF SUB-BIDDER: (Insert legal name of sub-bidder)

   U.M.A Project: U.M.A 17-10

   U.M.A. PROJECT: Morrill I and IV North 1st and 3rd Floor Microbiology Consolidation

   SUB-BID FOR SECTION: SUB-BID FOR SECTION: 099000 – Painting and Coating

2.   Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the Commonwealth of Massachusetts General Laws, as amended. Sub-bid forms may be obtained at the Procurement website: http://www.umass.edu/procurement/constructionprojects.htm.

3.   Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the University of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

B.   Sub Sub-Bid Requirements: (None required under this Section.)

C.   Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings: A1.1, A2.0 – A5.2, A7.0 - A9.0, and referenced details.
1.3 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Field painting of exposed interior items and surfaces.
2. Touch up painting where cutting and patching is performed.
4. Cosmetic repairs to existing metal lab casework.

B. Alternates: Refer to Section 012300 – ALTERNATES.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 081113 - HOLLOW METAL DOORS AND FRAMES for factory priming steel doors and frames.
2. Section 081416 - FLUSH WOOD DOORS for factory finishing.
3. Section 092116 - GYPSUM BOARD ASSEMBLIES for surface preparation of gypsum board.
4. Section 123553 – LABORATORY CASEWORK for prefinished cabinetry items.

1.4 DEFINITIONS AND EXTENT

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned,
paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Designer will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:
   a. Metal Cabinetry
   b. Fire extinguisher cabinets.
   c. Finished mechanical and electrical equipment.
   d. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
   a. Furred areas.
   b. Pipe spaces.
   c. Duct shafts.

3. Finished metal surfaces include the following:
   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper and copper alloys.
   e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:
   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.5 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.
1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
   1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
   2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
   3. Submit two eight inch by 12 inch Samples for each type of finish coating for Designer's review of color and texture only.

C. Qualification Data: For Applicator.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
   1. Product name or title of material.
   2. Product description (generic classification or binder type).
   3. Manufacturer's stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.
   8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.
1.8 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.9 EXTRA MATERIALS

1. Not required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work are listed in the Finish Schedule at the end of this Section.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Designer about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions and technical bulletins for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.

c. If transparent finish is required, backprime with spar varnish.

d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.

e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.

a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.

b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

3. Use only thinners approved by paint manufacturer and only within recommended limits.
E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:
   1. Uninsulated metal piping.
   2. Uninsulated plastic piping.
   3. Pipe hangers and supports.
   4. Tanks that do not have factory-applied final finishes.
   5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
   6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
   7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

H. 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.

I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 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.
3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Designer.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 PAINT SCHEDULE

A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.

B. Interior Paint Schedule:

1. Basis of specification is for products by Sherwin Williams. Equal systems by Benjamin Moore, Duron, PPG or Glidden are acceptable. All products to be used shall be by a single manufacturer, and constitute a system.

2. **Interior Gypsum Wallboard and Plaster Walls for Latex Eggshell Finish:**
   
   One Coat: S-W Harmony Latex Wall Primer
   Two Coats: S-W ProMar 200 Zero VOC Latex Eggshell
   Color: Up to two colors, selected by Owner

3. **Interior Metals (Doors, Frames and Similar Items):**
   
   Surface Prep: Solvent Clean per SSPC-SP1
   One Coat: DTM Acrylic, Semi-Gloss (B66-200)
   Two Coats: S-W ProMar 200 Zero VOC Latex Eggshell
   Color: Up to two colors, selected by Owner

4. **Interior Wood (trim, etc.) for Latex Eggshell Finish:**
   
   One Coat: S-W Harmony Latex Wall Primer
   Two Coats: S-W ProMar 200 Zero VOC Latex Eggshell
   Color: Up to two colors, selected by Owner

5. **Existing Metal Cabinets (touchup):**
   Finish and color to match existing.

END OF SECTION
SECTION 101100
VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Markerboards.
2. Tackboards.

B. Alternates: Not Applicable.

C. Items To Be Installed Only:

1. The Owner will furnish whiteboards for installation by this contractor, where directed in the field, where noted on the Drawings. The Contractor will furnish all hardware required for installing them.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 061000 – ROUGH CARPENTRY, for blocking at locations to receive the work of this section.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show location of panel joints.
2. Show location of special-purpose graphics for visual display surfaces.
3. Include sections of typical trim members.

C. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide fabrics with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Designer. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display units vertically with packing materials between each unit.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating visual display surfaces without field measurements. Coordinate wall construction to ensure that actual dimensions correspond to established dimensions.

2. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.
PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. Low-Emitting Materials: Provide visual display boards made with adhesives and composite wood products that do not contain added urea formaldehyde.

2.2 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and 0.021-inch-thick, porcelain-enamel face sheet with low-gloss finish.

1. Available Manufacturers:
   a. Best-Rite Manufacturing.
   b. Claridge Products & Equipment, Inc.
   c. PolyVision Corporation.

B. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.

C. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.3 TACK ASSEMBLIES

A. Available Manufacturers:

1. Best-Rite Manufacturing.
2. Claridge Products & Equipment, Inc.
3. Egan Visual Inc.


2.4 ACCESSORIES

A. Aluminum Frames and Trim: Factory-applied, fabricated from not less than 0.062-inch-thick, extruded aluminum; of size and shape indicated.

B. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific wall panels and substrate application, as recommended in writing by visual display surface manufacturer, and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2.5 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

C. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.

2.6 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

D. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove dirt, scaling paint, projections, and depressions that will affect smooth, finished surfaces of visual display boards.

B. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, and substances that will impair bond between visual display boards and surfaces.
3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.4 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION
SECTION 101400

SIGNAGE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Interior room signs.
2. Safety signs at emergency showers and eyewash stations.
3. Fire extinguisher wall signs.
4. Clear insert holders, for paper information signs prepared and printed by the University.

B. Alternates: Portions of the work of this section are subject to the acceptance of Alternates. Refer to section 012300 – ALTERNATES.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 260001 - ELECTRICAL WORK for illuminated exit signs.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.

1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
C. Samples for Verification: For each type of sign, include the following Samples to verify color selected:

1. Panel Signs: Full-size Samples of each type of sign required.
2. Approved samples will not be returned for installation into Project.

D. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each sign type through one source from a single manufacturer.

B. Regulatory Requirements: Comply with the Massachusetts Architectural Access Board, Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

PART 2 - PRODUCTS

2.1 PROPRIETARY SPECIFICATION

A. Various portions of the building have been renovated recently, and common areas have received the new signage specified below. The intention of this project is to provide the same signage, so that the overall appearance of the common areas are uniform.

B. Signage shall match the existing signage newly installed throughout the building. No substitutions for the specified signage will be allowed, unless the appearance of the sign is considered identical in the opinion of the Architect and University.
2.2 INTERIOR ROOM SIGNAGE

A. Manufacturer: Appenx, 1370 Lincoln Ave., Holland, MI 49423, [www.appenx.com](http://www.appenx.com). No substitutions.

1. **Style:** Outsert Group

2. **Product Number:**
   a. At corridor doors to classrooms and laboratories: UM1511.4
   b. At corridor doors to other spaces, excluding stairs: UM511.3
   c. At corridor doors to stairs: UM99.R
   d. At doors within suites (not accessed directly from corridor): UM59.2

3. **General Features:**
   a. **Size:** As determined by specific tiles specified
   b. **Mount:** S – screw mount
   c. **Sidekick:** 3/8” square
   d. **Color:** MT – Medium Tone
   e. **Attach:** Locking

4. **Tile 1:**
   a. **Size:** 5-1/2” high x 2” wide
   b. **Color:** MT – Medium Tone
   c. **Copy Style:** 1/32” raised copy
   d. **Copy Color:** AP – Frost White
   e. **Copy Size:** 5/8”
   f. **Copy Position:** centered
   g. **Font:** Swis 721 Cn BT

5. **Tile 2:**
   a. **Size:** 2” high x 6-1/2” wide
   b. **Color:** AP – Frost White
   c. **Copy Style:** 1/32” raised number
   d. **Copy Color:** MT – Medium Tone
   e. **Copy Size:** 5/8”
   f. **Copy Position:** ½” Left
   g. **Font:** Swis 721 Cn BT

6. **Tile 3:**
   a. **Size:** 3-1/2” high x 6-1/2” wide
   b. **Color:** AP – Frost White
   c. **Copy Style:** 1/32” raised ADA tactile/braille
   d. **Copy Color:** MT – Medium Tone
   e. **Copy Size:** 5/8”
   f. **Copy Position:** ½” Left
   g. **Font:** Swis 721 Cn BT

7. **Tile 4 (Insert Holder)**
   a. **Size:** 12” high x 8-1/2” wide windows (11” viewing area)
b. Color: AL – Aluminum

c. Copy Style: Blank – customer to provide paper insert

d. Copy Size: N/A

e. Copy Position: N/A

f. Font: N/A

B. General: Provide signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction indicated. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16\textsuperscript{th} inch measured diagonally. Provide the following:

1. Code-required signs for Certificate of Occupancy:

   a. Type: Photopolymer on acrylic or printed acrylic/aluminum as applicable.
   b. Color: Custom color as selected.
   c. Type Size: As selected.
   d. Typeface: As selected.

C. Tactile and Braille Copy: Manufacturer’s standard process for producing copy complying with 521CMR, ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Raised Copy Thickness: 1/32”.

D. Accessories:

1. Mounting Methods: Use double-sided vinyl tape fabricated from materials that are not corrosive to sign material and mounting surface.

2. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 SAFETY SIGNS

A. Emergency Shower/eyewash:

1. Shower: Brady #22639, 10”x14”, white copy on green plastic sign, copy to read “emergency shower”.

2. Eyewash: Brady #22665, 7”x10”, white copy on green plastic sign, copy to read “eye wash station”.

3. Combination shower/eyewash: Brady #22654, 7”x10”, white/green, copy to read “safety shower and eyewash station”.

SIGNAGE  April 2017 101400 - 4
B. Fire Extinguishers: Brady #45368, 5 ½" x 10" with 4" maximum projection, one above each fire extinguisher, mounted at height to be determined in field.

C. Sinks:
   1. Lab bench sinks: custom adhesive vinyl die-cut or silk-screened sign, 3” x 5”, reading “NON-POTABLE WATER”.
   2. Handwashing sinks: custom adhesive vinyl die-cut or silk-screened sign, 3” x 5”, reading “HANDWASHING ONLY”.

2.4 ACCESSORIES

A. Mounting Methods: Use double-sided vinyl tape fabricated from materials that are not corrosive to sign material and mounting surface.

B. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

   1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
2. **Interior Wall Signs:** Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. **Wall-Mounted Panel Signs:** Attach panel signs to wall surfaces using methods indicated below:

1. **Vinyl-Tape Mounting:** Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

### 3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by the UMA Project Manager.

### 3.4 SCHEDULE OF SIGNAGE

A. Interior room signs shall be installed 60" a.f.f., on the wall adjacent to the strike side of the door noted, or as directed in the field, where no such wall space exists.

B. Contractors are advised that room numbers which appear on the Drawings may not be the final room number assigned to spaces by UMA. Copy for each room identification sign will be furnished upon receipt of submittals.

C. Provide interior rooms signs as follows:

<table>
<thead>
<tr>
<th>Door No.</th>
<th>Tile 1</th>
<th>Tile 2</th>
<th>Tile 3</th>
<th>Insert Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>N101-1</td>
<td>Morrill 4N</td>
<td>N101</td>
<td>LABORATORY</td>
<td>Yes</td>
</tr>
<tr>
<td>N101-2</td>
<td><em>omit tile</em></td>
<td>N224A</td>
<td><em>omit tile</em></td>
<td>No</td>
</tr>
<tr>
<td>N101A-1</td>
<td>Morrill 4N</td>
<td>N101A</td>
<td>LAB SUPPORT</td>
<td>Yes</td>
</tr>
<tr>
<td>N101B-1</td>
<td>Morrill 4N</td>
<td>N101B</td>
<td>OFFICE</td>
<td>No</td>
</tr>
<tr>
<td>N103-1</td>
<td>Morrill 4N</td>
<td>N103</td>
<td>LABORATORY</td>
<td>Yes</td>
</tr>
<tr>
<td>N103A-1</td>
<td>Morrill 4N</td>
<td>N103A</td>
<td>LAB SUPPORT</td>
<td>Yes</td>
</tr>
<tr>
<td>N103B-1</td>
<td>Morrill 4N</td>
<td>N103B</td>
<td>OFFICE</td>
<td>No</td>
</tr>
<tr>
<td>N105-1</td>
<td>Morrill 4N</td>
<td>N105</td>
<td>CONFERENCE</td>
<td>No</td>
</tr>
<tr>
<td>N106-1</td>
<td>Morrill 4N</td>
<td>N106</td>
<td>LABORATORY</td>
<td>Yes</td>
</tr>
<tr>
<td>N106-2</td>
<td>Morrill 4N</td>
<td>N106</td>
<td>LABORATORY</td>
<td>Yes</td>
</tr>
<tr>
<td>N106A-1</td>
<td>Morrill 4N</td>
<td>N106A</td>
<td>LAB SUPPORT</td>
<td>Yes</td>
</tr>
<tr>
<td>N106B-1</td>
<td>Morrill 4N</td>
<td>N106B</td>
<td>OFFICE</td>
<td>No</td>
</tr>
<tr>
<td>Ex. N107</td>
<td>Morrill 4N</td>
<td>N107</td>
<td>LOADING DOCK</td>
<td>No</td>
</tr>
<tr>
<td>N107A-1</td>
<td>Morrill 4N</td>
<td>N107A</td>
<td>OIT IDF ROOM</td>
<td>No</td>
</tr>
<tr>
<td>N107B-2</td>
<td>Morrill 4N</td>
<td>N107B</td>
<td>STORAGE</td>
<td>No</td>
</tr>
<tr>
<td>Ex. N109A</td>
<td>Morrill 4N</td>
<td>N107C</td>
<td>STORAGE</td>
<td>No</td>
</tr>
<tr>
<td>N110-1</td>
<td>Morrill 4N</td>
<td>N110</td>
<td>LABORATORY</td>
<td>Yes</td>
</tr>
<tr>
<td>N110-2</td>
<td>Morrill 4N</td>
<td>N110</td>
<td>LABORATORY</td>
<td>Yes</td>
</tr>
<tr>
<td>N110A-1</td>
<td>Morrill 4N</td>
<td>N110A</td>
<td>OFFICE</td>
<td>No</td>
</tr>
</tbody>
</table>
### Door No. | Tile 1 | Tile 2 | Tile 3 | Insert Holder
---|---|---|---|---
N110C-1 | Morrill 4N | N110C | GAS CYLINDER CLOSET | Yes
N111-1 | Morrill 4N | N111 | EQUIPMENT ROOM | Yes
N111A-1 | Morrill 4N | N111A | EQUIPMENT ROOM | Yes
N111C-1 | Morrill 4N | N111C | GAS CYLINDER CLOSET | Yes
N114-1 | Morrill 4N | N114 | EQUIPMENT ROOM | Yes
N304-1 | Morrill 4N | N304 | LABORATORY | Yes
N304-1 | Morrill 4N | N304 | LABORATORY | Yes
N304A-1 | Morrill 4N | N304A | LAB SUPPRT | Yes
N304B-1 | Morrill 4N | N304B | OFFICE | No
N308-1 | Morrill 4N | N308 | OFFICE | No

The following signs are part of Alternate #1

Ex. 309 | Morrill 1 | N323 | OFFICE | No
Ex. 311A | Morrill 1 | N325 | LABORATORY | Yes
N331-1 | Morrill 1 | N331 | OFFICE | No
N333-1 | Morrill 1 | N333 | OFFICE | No
N335-1 | Morrill 1 | N335 | OFFICE | No
N339-1 | Morrill 1 | N339 | LAB SUPPORT | Yes
Ex. 313 | Morrill 1 | N341 | STORAGE | No
Ex. 315 | Morrill 1 | N343 | STORAGE | No
Ex. 317 | Morrill 1 | N345 | CLASSROOM | No
Ex. 319 | Morrill 1 | N347 | CLASSROOM | No
Ex. 321 | Morrill 1 | N349 | CLASSROOM | No

The following signs are part of Alternate #2

N337-1 | Morrill 1 | N337 | OFFICE | No

D. Provide (1) sign per fire extinguisher.

E. Provide (1) sign at each shower/eyewash or eyewash station. Where separate shower and eyewash are installed, provide separate signs.

F. Provide (1) sign at each lab bench sink.

G. Provide (1) sign at each handwashing sink.

END OF SECTION
SECTION 104400
FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Portable fire extinguishers.
2. Fire-protection cabinets for portable fire extinguishers.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. None.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each item.

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
3. Show location of knockouts for hose valves.

B. Maintenance Data: For fire extinguishers.
1.4 QUALITY ASSURANCE
A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
D. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION
A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS
A. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 FIRE-PROTECTION CABINET
A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. JL Industries, Inc. “Ambassador” 1027-V-10
   3. Potter Roemer; Div. of Smith Industries, Inc. 1734
B. Cabinet Type: Suitable for fire extinguisher size noted. Fire rated where installed in corridor walls.
C. Cabinet Material: Aluminum.
D. Semi-Recessed Cabinet: Cabinet box semi-recessed in walls of sufficient depth to suit style of trim indicated.
1. Recess: 3-1/2”
2. Max projection past wall: < 4”.

E. Door Material: Aluminum, clear finish.

F. Door Style: Vertical duo panel with frame.

G. Door Glazing: Acrylic.

H. Door Trim: Rolled Edges.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

2.3 FABRICATION

A. Aluminium: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209
2. Extruded Shapes: ASTM B 221

B. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material.
   a. Provide factory-drilled mounting holes.

C. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

D. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 FINISHES, GENERAL

A. Finish to be satin clear coat.

B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Finish fire-protection cabinets after assembly.

E. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for hose valves and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

C. Examine fire extinguishers for proper charging and tagging. Contractor shall be responsible for fire extinguisher tagging by a certified service technician located within 75 miles of the project.
   1. Remove and replace damaged, defective, or undercharged units.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated on the Drawings and acceptable to authorities having jurisdiction.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.
3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.5 SCHEDULE

A. Furnish one extinguisher per lab suite, complete with surface mounted hook. Install where indicated on Drawings, or if not indicated, install adjacent to main entry door to lab, where directed in field by the Architect.

B. Furnish two extinguishers complete with semi-recessed cabinets, for installation in corridors where existing cabinets are currently located.

END OF SECTION
SECTION 115300

LABORATORY EQUIPMENT

PART - 1 GENERAL

1.1 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. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following

1. Autoclaves.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items furnished by others:

1. None.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. None.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. SECTION 220001 - PLUMBING for plumbing connections to equipment.
2. SECTION 230001 - HVAC for ducts, controls, alarms and balancing of hoods.
3. SECTION 260001 - ELECTRICAL for power to equipment.

1.3 WORK BY OTHERS

A. UMA will move existing scientific equipment from other rooms in the building, to the project area.

1.4 QUALITY ASSURANCE

A. All equipment shall bear the label of a Nationally Recognized Testing Agency (UL, ETL,
1.5 REFERENCES

A.

1.6 SUBMITTALS

A. Submit under the provisions of section 01330.

B. Submit specification sheets and product manuals for all specified equipment.

C. Submit shop drawings indicating installation.

D. Sample pieces of the hood exterior wall material, interior liner and baffle material, work surface material, and color selection chips shall be available from the hood manufacturer upon request. Color to be selected by Owner from the manufacturer’s full range of available options.

1.7 DELIVERY AND STORAGE

A. Equipment shall be delivered adequately protected from damage during shipment.

B. Schedule delivery such that equipment can be brought to its final location within the project area upon receipt, and not require moving equipment around the project area as other Work is completed.

1.8 WARRANTY

A. Manufacturer’s warranty against defects in material or workmanship on its fume hoods shall be for 1 year from date of installation or 2 years from date of purchase, whichever is sooner, shall include replacement of parts (except lamps) and labor.

B. Contractors standard project warranty of 1 year will include rebalancing and retesting if required due to performance problems.

PART - 2 PRODUCTS

2.1 GENERAL

A. All lab equipment shall be listed by Underwriter’s Laboratory, ETL or another Nationally Recognized Testing Agency acceptable to the Authorities Having Jurisdiction. Equipment shall bear the testing lab’s sticker, signifying approval.

2.2 AUTOCLAVE

A. Acceptable manufacturers:
1. BetaStar .............................................. Model LS262639-SSA-PHC
2. Consolidated Sterilizer Systems, ............................. Model SR-26A
3. Primus Sterilizer Company, LLC, .......................... Model PSS5BMSSD
4. Getinge USA,  .............................................. Model 6610

B. Product Description:

1. Microcomputer controlled automatic steam sterilizer equipped to operate vacuum, gravity and liquid cycles. Microprocessor with touch keypad interface will control all system functions, monitor system operations, visually and audibly alert operator of cycle malfunctions, and, on command, visually indicate chamber temperature and pressure. Integrity of piping and door seals monitored with preprogrammed leak test. Solid state printer shall document and record each cycle's performance with such data as time and date that unit is opened, cycle number, set points and cycle selected. Full controls, as described above, on load and unload side.

2. Unit design shall allow for "general purpose" steam sterilization of unwrapped equipment, wrapped instruments and utensils as well as liquids in vented or unsealed containers at temperatures ranging from 100 - 138°C (212 - 280°F). Cycle times for dry, wrapped goods shall not exceed a guaranteed 60 minutes from door closed to door open. Temperature uniformity within chamber +/-1.8°C (+/-2°F) during cycles. Unit designed to meet or exceed ASME Code for Unfired Pressure Vessels, Section VIII (U-1 stamp of compliance); ASME Boiler and Pressure Vessel Code, Section IX; American Welding Society (AWS).

3. Sterilizer chamber interior dimensions shall be 26" x 26" x 39" and constructed of solid type 316L stainless steel with a 10 RA or better finish and jacketing constructed of type 304 or 316L stainless steel. Chamber completely insulated with minimum 1" mineral wool encased in a rigid removable sheet aluminum housing. All serviceable components shall be mounted on one side of chamber for ease of service. Piping to chamber shall be brass. Door shall be open vertically and be recessed behind the fascia panel for optimum operator safety.

4. Provide with each unit, unless otherwise noted:
   (a) Drain discharge cool-down system to reduce all discharges to 140°F, or less
   (b) Drain line strainer

5. Utilities: The unit shall be fabricated for connection to the following utilities, by other trades:
   (a) Steam: 1/2" NPT, 50 to 80 psig, 100 lbs/hour, 97 - 100% saturated suitably trapped to ensure dry condensate free steam, filtered to remove particles.
   (b) Water: 1/2" NPT, less than 70°F, 50-70 psig, 8 gallon per minute flow rate.
   (c) Sterilizer Drain: 3/4" NPT to 2" floor drain
PART - 3 EXECUTION

3.1 EXAMINATION

A. Verify equipment rough-in before proceeding with work.

B. Coordinate with other trades for the proper and correct installation of plumbing and electrical rough-in and for rough opening dimensions required for the installation of the hood.

3.2 INSTALLATION

A. Remove and dispose of all packing materials, and protective films. Assemble and install according to manufacturer's instructions.

B. Install according to standards required by authority having jurisdiction.

C. Install equipment plumb, square and straight with no distortion and securely anchor as required.

D. Sequence installations to ensure utility connections are achieved in an orderly and expeditious manner.

E. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect.

3.3 AUTOCLAVE

A. Coordinate with trades installing utilities, to allow connection of any fitting, valves or other items on the units itself, which would be difficult to install once the unit is in place.

B. Set unit in the location where directed. Plumb and level unit following manufacturer’s recommendations.

C. After connection of utilities by other trades, but prior to initial start-up, arrange for an installation inspection and start-up by a manufacturer’s authorized agent.

1. Agent shall perform initial setup and programming, run first cycle and make any adjustments required.

2. Agent shall also provide training to University personnel, at a time to be determined. Anticipate that training will be completed in a single trip, and take a maximum of 4 hours. Training may involve addressing two separate groups (Physical Plant and Researchers).
3.4 PROTECTION OF FINISHED WORK

A. Provide all necessary protective measures to prevent exposure of equipment and surfaces from exposure to other construction activity.

B. Advise contractor of procedures and precautions for protection of material and installed equipment and casework from damage by work of other trades.

3.5 DEMONSTRATION

A. Schedule and provide on site training session and systems demonstration for Owner’s staff, and demonstrate all equipment operations and functions.

END OF SECTION
PART - 1 GENERAL

1.1 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. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following

1. Bench-top laboratory fume hoods.
2. Fume hood base cabinets. Fume hood base stands.
3. Work tops within fume hoods.
5. Piping and wiring within fume hoods for service fittings, light fixtures, fan switches, and other electrical devices included with fume hoods.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items furnished by others:

1. None.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. None.

E. Related Work: The work of this section requires factory pre-piped and pre-wired fume hoods with all services run to the top of the hood for final field connections by the appropriate mechanical and electrical trades. The following items are not included in this Section and will be performed under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for wood blocking for anchoring fume hoods.
2. Section 096500 - RESILIENT FLOORING AND ACCESSORIES for resilient base applied to fume hood base cabinets. SECTION 123553 – LABORATORY
CASEWORK for cabinets and worksurfaces not associated with fume hoods.

3. SECTION 220001 - PLUMBING for plumbing connections to equipment.

4. SECTION 230001 - HVAC for ducts, controls, alarms and balancing of hoods.

5. SECTION 260001 - ELECTRICAL for power to equipment.

1.3 PERFORMANCE TESTING REQUIREMENTS

A. Prepurchase testing shall be performed for 100% of fumehoods, according to the below referenced standards.

B. Testing shall be performed by a qualified independent third party testing agent. Testing shall be performed before bids are submitted based on the actual design of the proposed hood.

C. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110 as modified by National Institute of Health (N.I.H.) and as described below at a release rate of 6.0 L/min.:  

D. Face Velocity Test:
   1. Follow ASHRAE 110 face velocity measurement test with hood at 80 fpm (+/- 5 percent) average face velocity.
   2. Vertical sash: Test at 18-inch vertical sash design opening. Open sash to full open and record average face velocity for the exhaust rate conditions described above.
   3. Combination sash: At the three exhaust rates described above, measure average face velocity with vertical sash closed and horizontal sash opened at center, left open, and right open positions.

E. Smoke Visibility Test: Conduct smoke visibility tests according to ASHRAE 110 (large challenge and normal challenge) at the three exhaust rates for vertical design opening, vertical full open, and three combination sash positions.

F. Tracer Gas Tests:
   1. Conduct prepurchase and as-installed tests for 100% of fumehoods.
   2. Static Test: Conduct with manikin at 22-inches above the work surface. Conduct at three exhaust rates, design open vertical, full open vertical, and three horizontal open configurations. Repeat static tests with heat load challenge.
   3. Perimeter scan: Conduct at all static test positions and flow rates as well as with sash fully closed at rates equal to 200 and 250 air changes per hour based on the internal volume of the fume hood in front of the rear baffle.
4. Sash Movement Effect: Conduct in vertical sash configuration at the three exhaust rates.

5. Average Face Velocity: 80 fpm plus or minus 10 percent with sashes in raised position.
   (a) Face-Velocity Variation: Not more than 10 percent of average face velocity.

   (a) Test hoods with combination sashes fully raised, with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.

7. As-Manufactured (AM) Rating: AM 0.05.

8. As-Installed (AI) Rating: AI 0.10 (0.10 ppm).

9. Test Setup Modifications: Conduct tests with a minimum of three and a maximum of five people in the test room and with two 1-gal. round paint cans, one 12-by-12-by-12-inch cardboard box, and three 6-by-6-by-12-inch cardboard boxes in the fume hood during the test. Position items from 6 to 10 inches behind the sash, randomly distributed, and supported off the work surface by 2-by-2-inch blocks.

10. Walk-by Test: At the conclusion of containment test, execute three rapid walk-bys at 30-second intervals, 12 inches behind the mannequin. Test-gas concentration during each walk-by shall not exceed 0.1 ppm and shall return to specified containment value within 15 seconds.

G. Static-Pressure Loss: Not more than 3/8-inch wg at 80-fpm face velocity when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

H. Structural Performance: Provide fume hood components capable of withstanding the following loads without permanent deformation, excessive deflection, or binding of cabinet drawers and doors:

1. Fume Hood Base Stands: 50-lb/ft. work top, 75 lb/ft. on work top, plus weight of hood.

I. Delegated Design: Design fume hoods, including comprehensive engineering analysis by a qualified professional engineer, using seismic performance requirements and design criteria indicated.

J. Seismic Performance: Fume hoods shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
1. Design earthquake spectral response acceleration, short period (Sds) for Project is 0.245g.

2. Seismic Importance Factor is 1.5.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of product indicated. Include plans, elevations, sections, details, and attachments to other work.

1. Provide shop drawings produced by the fume hood manufacturer, not the supplier or installer.

2. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports. Include calculations demonstrating that anchorages comply with seismic performance requirements.

3. Indicate locations and types of service fittings together with associated service supply connection required.

4. Indicate duct connections, electrical connections, and locations of access panels.

5. Include roughing-in information for mechanical, plumbing, and electrical connections.

6. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from above items.

7. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.

8. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Verification: For fume hood exterior finishes, interior lining, and work top material, in manufacturer's standard sizes.

D. Delegated-Design Submittal: For fume hoods indicated to comply with seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Product Test Reports: Showing compliance with specified performance requirements for as- manufactured containment (as modified by the NIH) and static pressure loss based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.

F. Source quality-control reports.
G. Field quality-control reports for containment only. Refer to Division 23 for Testing and Balancing of laboratories.

H. Provide all of the above in indexed and tabulated 3-ring binder. Provide number of binders as specified under Division 01.

1.5 QUALITY ASSURANCE

A. Source Limitations for Laboratory Fume Hoods: Obtain fume hoods from single manufacturer.

B. Product Designations: Drawings indicate nominal sizes, types, and configurations of fume hoods and are not meant to be proprietary. Specified manufacturers' standard hoods of similar sizes, types, and configurations, and complying with the Specifications, will be considered. See Division 01.

C. Product Standards: Comply with following:

1. SEFA 1, Laboratory Fume Hoods - Recommended Practices.
2. UL 1805 - Provide fume hoods UL listed and labeled for compliance with.
3. ASHRAE 110-95 – Permanently label each fume hood front to certify compliance.
4. NFPA 45: minimum air flow requirements for VAV Hoods
5. OSHA 29: Operational criteria
6. American Conference of Governmental Industrial Hygienists: min. containment level
7. ANSI/AIHA Z9.5-2012: Laboratory Ventilation

D. Safety Glass: Products complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

E. Pre-installation Conference: Conduct conference at Project site.

F. Installer Qualifications: installer shall be certified by fume hood manufacturer for assembly and installation of fume hood equipment.

1. Installer shall have a minimum of 5-years experience installing fume hoods.
2. Demonstrated Quality of Workmanship: Minimum of 10 installations completed within the last 5-years of comparable scope and size.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.
1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for lateral support of fume hoods.

B. Coordinate installation of fume hoods with laboratory casework, fume hood exhaust ducts, and plumbing and electrical work.

1.9 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged fume hood finish.

1.10 WARRANTY

A. Provide extended 10-year warranty for defects including but not limited to: rusting, peeling, blistering, fading of fume hood painted and stainless steel finishes.

PART - 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following. No Substitutions:

1. Kewaunee Scientific Corporation; Laboratory Products Group. Supreme Air LV; [Lab Furniture Installations & Sales, Inc. 978.646.0600]

2. Labconco XStream: [Labconco 816.333.8811]


4. Bedcolab Ltd. Vanguard Series [Bedcolab, 514-.384-.2820]


2.2 MATERIALS

A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.
B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316, stretcher-leveled standard of flatness.

C. Glass-Fiber-Reinforced Polyester: Polyester laminate with a chemical-resistant gel coat on the exposed face, and having a flame-spread index of 25 or less per ASTM E 84.

D. Epoxy: Factory molded, modified epoxy-resin formulation with smooth, nonspecular finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   (a) Durcon Company (The).
   (b) Epoxyn Products.
   (c) Kewaunee Scientific Corporation.

2. Physical Properties:
   (a) Flexural Strength: Not less than 10,000 psi.
   (b) Modulus of Elasticity: Not less than 2,000,000 psi.
   (c) Hardness (Rockwell M): Not less than 100.
   (d) Water Absorption (24 Hours): Not more than 0.01 percent.
   (e) Heat Distortion Point: Not less than 380 deg F.
   (f) Flame-Spread Index: 25 or less per ASTM E 84.

3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
   (a) No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.

   (b) Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).


E. Glass-Fiber Cement Board: ASTM C 1186.

F. Interior Construction Acid Hoods ½ “ stress relieved all seam welded white polypropylene.

G. Glass Solvent Hoods: Clear, laminated glass complying with ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality-Q3; with two lites not less than 3.0 mm thick and with clear, polyvinyl butyl interlayer. Total thickness not less than 6.35 mm (1/4 in)

H. Sash Acid Hoods: Lexan/polycarbonate
I. Fasteners: Provide stainless-steel fasteners where exposed to fumes.

2.3 FUME HOOD VENTILATION

A. Variable-Air-Volume Control: equip fume hoods with an electronic control unit with a sensing device that monitors face velocity, and a motorized damper on the exhaust connection that maintains a constant face velocity by controlling air volume in response to control unit.

B. Purge button: Equip units with manual override switch that opens motorized damper to provide programmed maximum exhaust capacity regardless of sash position.

C. Fume hood monitor: Fume hoods shall be roughed in for air volume control monitor and anemometer port provided by Division 23.

D. Airflow Indicator: Comply with requirements of Division 23. Provide cut outs, where indicated, and back boxes to accommodate an anemometer sensor, furnished by Division 23.

E. Airflow Display and Alarm: Comply with requirements of Division 23. Provide cut outs, where indicated, and back boxes to accommodate hood face velocity display, furnished by Division 23.

2.4 FABRICATION

A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 48-by-96-inch door opening.

1. Fume Hood Depth: Clear interior depth shall be as indicated on drawings from face of baffle to inside face of sash. Do not exceed 40 in.

2. Fume Hood Height: Clear interior height shall be as indicated on drawings at 12" in front of rear baffle.

B. Steel Exterior: Fabricate from steel sheet, not less than 0.050 inch (18 ga) thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.

C. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and utility control valves.

1. Splay (chamfered or angled) top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
2. Provide end panels not more than 5 in wide for fume hood superstructures.

D. Interior Lining: Provide the following unless otherwise indicated:

1. Glass-fiber-reinforced polyester, not less than 1/4 inch thick.
2. White polypropylene ½”.
3. Hoods indicated for radioactive use shall have stainless steel liners

E. Lining Assembly: Unless otherwise indicated, assemble with stainless-steel fasteners or epoxy adhesive, concealed where possible. Seal joints by filling with chemical-resistant sealant during assembly.

1. Fasten lining components to a rigid frame assembly fabricated from stainless steel and to which exterior panels are attached.
2. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.

F. Rear Baffle: Unless otherwise indicated, provide baffle, of same material as fume hood lining, at rear of hood with openings at top and bottom for airflow through hood. Secure baffle to cleats at rear of hood with stainless-steel screws. Fabricate baffle for easy removal for cleaning behind baffle. Baffle shall provide for face velocity distribution and containment.

1. Provide preset baffles.
2. Provide epoxy-coated, stainless-steel screen at bottom baffle opening to prevent paper from being drawn into the exhaust plenum behind baffles.
3. Provide access panels to access service items such as utility valves on the inside face of the end panels.

G. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining, and with bell mouth duct stub for exhaust connection.

1. Duct-Stub Material: Type 316 stainless steel.

H. Restricted Bypass: Provide clear view restricted bypass openings for bypass and restricted bypass fume hoods. Bypass blank off panel to be field adjustable.

1. Provide ¼ in clear or smoked laminated safety glass adjustable bypass panel.
2. Restricted bypass is to be sized to allow for an inward flow of not more than 300 fpm at 250 air changes per hour based on the internal volume of the hood in front of the baffle accounting for the airfoil with sash fully closed.
3. Fumehood static pressure not to vary more than 5% from sash open to sash closed.

I. Sashes: Provide operable combination sashes in all hoods.
   1. Provide clear sash opening of not less than 27 in.
   2. Fabricate from 0.050-inch (18 ga) nominal thickness stainless steel. Form into four-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets. Provide mullion at sash jamb.
   3. Glaze with 6.35 mm (¼ in) laminated safety glass.
   4. Counterbalance vertical-sliding sash with sash weight and stainless-steel chain and sprocket system to hold sash in place regardless of position. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.

J. Airfoil: Provide a flush, hinged airfoil at bottom of fume hood face opening with 1-inch space for air bypass into hood when sash is closed. Sash closes on top of airfoil, leaving 1-inch opening for air intake. Airfoil directs airflow across work top to remove heavier-than-air gases and to prevent reverse airflow.
   1. Fabricate airfoil from Type 316 stainless steel.

K. Light Fixtures: Provide vapor proof, rapid-start, LED or two-tube fluorescent light fixtures of longest practicable length (complete with new lamps). Shield fixture/lamps from hood interior with 1/4-inch-thick laminated glass or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with tubes / LEDs that are easily replaceable from outside of fume hood.
   1. Provide color temperature of 3500 K and minimum color-rendering index of 82 and interior illumination of 80 foot candles.
   2. Provide recessed mounted switch for light fixture on the exterior jamb of the fume hood and provide a painted steel plate with silkscreen label reading Light Switch.
   3. Provide sound rated ballasts.

L. Base Cabinets:
   1. Cabinets shall be provided by the same provider of the laboratory casework. Comply with Section 123553 - LABORATORY CASEWORK.
   2. Provide metal bodied base cabinets with door and drawer front finishes matching adjacent laboratory casework wood fronts in sizes and types as indicated on drawings.
   3. Provide cabinet signage as indicated: 3 in high individual letters in black opaque
color, without background, directly applied to wood door fronts.

4. Acid Storage Cabinets. Provide where indicated. Acid Storage-Cabinet Lining: 1/4-inch- thick, polyethylene or polypropylene.

   (a) Provide manufacturer’s standard 1 ½ in polyethylene or polypropylene vent kit.
   (b) Extend vent pipe/conduit to top of fume hood behind rear baffle. Terminate vent above and behind fume hood rear baffle linear material.
   (c) Provide one adjustable polyethylene or polypropylene half depth shelf with spill retention tray.
   (d) Provide removable back panel.
   (e) Provide 1 in spill lip at bottom of cabinet.
   (f) Provide signage: “Corrosive Storage”.

5. Flammable Storage Cabinets. Provide where indicated. Flammable storage cabinets shall be Factory Mutual Approved and UL listed and in full compliance with NFPA standards and OSHA regulations.

   (a) Provide two, 2 in pipe threaded vent outlets with flame arrestors on back of cabinet.
   (b) Provide 1 ½ in, type 304 stainless steel vent kit where indicated. Coordinate connection of stainless steel vent kit with Division 23.
   (c) Provide grounding screw, field ground cabinet grounding screw to building electrical ground.
   (d) Provide signage: “Caution Flammable – Keep Fire Away”.
   (e) Provide capacity signage for each size cabinet.

M. Work Top and Sinks:

1. Work Tops, General: Provide units with smooth surfaces free of defects. Make exposed edges and corners straight and uniformly beveled. Where acid storage cabinets are indicated beneath fume hoods, Do Not provide holes in work tops to accommodate cabinet vents, install vent kits in service hole cutout contained within jamb of fume hood shell as indicated.

2. Resin Work Tops for Solvent Hoods:

(b) Work Top Configuration: 1 ¼ in thick epoxy resin, dished 3/8 in to contain spills as indicated on drawings.

(c) Provide an engraved and yellow epoxy filled safety stripe in the worktop located 6 in behind the sash. Strip shall be 1/4 in wide x 1/8 in deep by the full width of the hood.

3. Cup Sinks: Epoxy, 3-by-6-inch oval.

(a) Provide with polypropylene strainers and integral tailpieces.

(b) Provide raised edge above work surface.

4. Work tops and sinks within hoods noted to be for radioactive use shall be stainless steel.

N. Filler Strips: Provide as needed to close spaces between fume hoods or fume hood base cabinets and adjacent building construction. Fabricate from same material and with same finish as fume hoods or fume hood base cabinets, as applicable.

1. Provide sight proof vents at base cabinet filler strips.

O. Ceiling Extensions: Provide fascia filler panels matching laboratory casework wood fronts or fume hood exterior (as indicated on drawings), to enclose space above fume hoods at front and sides of fume hoods. Fascia to extend from tops of fume hoods to 3-inches minimum above ceiling, unless otherwise indicated on drawings.

1. Fascia panel to be removable to allow service access to top of hood.

P. Finished Back Panels: Where rear surfaces of fume hoods are exposed to view, provide finished back panels matching rest of fume hood enclosure.

Q. Comply with requirements in Divisions 22 and 26 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods unless otherwise indicated.

2.5 CHEMICAL-RESISTANT FINISH

A. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.

B. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply fume hood manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime
coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2. Colors for Fume Hood Finish: Custom color to be selected by the Architect from the manufacturer’s full and unrestricted color range, to exactly match adjacent laboratory casework metal finishes.

2.6 ACCESSORIES

A. Service Fittings: Comply with requirements in Section 123553 - LABORATORY CASEWORK, Divisions 22 - PLUMBING, and Division 26 - ELECTRICAL.

B. Fume Hoods shall be pre-piped for all plumbing services scheduled to a single point of connection for each plumbing service. Plumbing services shall be piped a minimum of 6 in above the top of the fume hood. Where there is more than one fitting for a given service, combine pipes into one service connecting point at the top of the hood. Terminating pipe sizes shall match those shown on the plumbing and HVAC drawings.

1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, finished with acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes.

2. Provide Service fitting outlets within the exposed surface color coded coordinated with remote valve handle color index identifier to match DHSP designations and lab bench turret colors.

3. Refer to Division 22 Plumbing specification for pipe material, size, and joining methods.

4. Seal all open ended conduit for protection from dust or construction debris.

5. Provide tags for all wires identifying service.

6. Rod actuated remote control valves are not permitted.

7. Cold Water and Chilled water supply and return piping to be factory insulated.

C. Fume hoods shall be pre-wired for services scheduled for a single point of connection for each electrical service. Electrical and control wiring shall terminate in junction boxes at or near the same point.

1. Provide specification grade 20A/125V electrical duplex receptacles mounted on hood exterior, UL listed, NEMA 5-20R and equipped with ground fault interrupters. Provide stainless steel flush plates, silkscreened with the number of the appropriate
electrical panel and circuit designation. Provide power connections for receptacles, and light and monitor alarm system at junction boxes on top of hood.

2. Provide separate circuits for light fixture, electrical outlets.

3. Seal all open ended conduit for protection from dust or construction debris.

4. Provide tags for all wires identifying service.

5. Coordinate with Class 1 Division 2 electrical requirements for fumehoods in designated spaces, as indicated on drawings.

D. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 18-inches of sash height. Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood.

1. Provide 1 in x 3 in engraved type 304 stainless steel plaque installed on the jamb post at specified operating height. Provide plaque with an engraved arrow and the following text: “Maximum Operating Sash Height – Set Up Only Above This Line”

2. Provide mechanism to gradually return sash to 18 in design position.

E. Hood and Valve Plaque: Provide an engraved stainless steel plaque installed on the hood lintel with the owner’s hood number and associated valve number and electrical circuits.

2.7 SAFETY ITEMS:

A. Provide instructions covering safe and correct operation of fume hoods in the following three forms:

1. A corrosive-resistant plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories and sash use.

2. Written instructions in booklet form providing additional details on safe and correct operation and maintenance.

3. A video in DVD format outlining correct hood usage and operation of at least 15 minutes duration.

2.8 SOURCE QUALITY CONTROL

A. Demonstrate fume hood performance before shipment by testing fume hoods according to the Performance Requirements Article. Provide testing facility, instruments, equipment, and materials needed for tests.

PART - 3 EXECUTION
3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fumehoods according to Shop Drawings and manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels, but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

1. Do not install damaged units.

B. Comply with requirements in Section 123553 - LABORATORY CASEWORK for installing fume hood base cabinets, work tops, and sinks.

C. Coordinate the work of this Section with the schedule and other requirements of other work being performed in the area at the same time with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.

3.3 FIELD QUALITY CONTROL

A. Field Testing: Field testing is required for all fume hoods after the building HVAC system is balanced. Engage an independent testing agency acceptable to owner to perform the field testing. Submit qualifications of independent testing agency prior to engagement.

B. Field test installed fume hoods according to the Performance Requirements Article to verify compliance.

1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.

2. After making corrections, retest fume hoods that failed to perform as specified.

3.4 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

LABORATORY FUME HOODS

April 2017

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END OF SECTION
SECTION 123553

LABORATORY CASEWORK

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

B. This Contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included:

1. Steel laboratory base, wall and freestanding cabinets.
2. Steel fixed height and adjustable height tables.
3. Worksurfaces, uprights and shelving.

B. Alternates: not applicable

C. Items To Be Installed Only:

1. The Owner will supply certain base and wall cabinets for installation by the Contractor. Cabinets are currently stored in Morrill, and shall be transported from the stored locations to the final locations by the contractor.
2. Fume hood base cabinets shall be manufactured by the manufacturer of the lab casework package, and as specified in 115313 - LABORATORY FUME HOODS.

D. Items to be Furnished Only:

1. None. All items furnished under the Section shall be installed by this Contractor.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for blocking in locations to receive the work of this Section.
2. Section 115300 - LABORATORY EQUIPMENT for base cabinets and work surfaces at fume hoods.
3. Section 220001 - PLUMBING for faucets, valves and fitting associated with casework and for plumbing connections to sinks furnished/installed by this Contractor.

4. Section 260001 - ELECTRICAL for outlets, receptacles, lighting and other electrical components integrated into the work surfaces and uprights.

1.3 REFERENCES

A. SEFA 3 - Scientific Equipment and Furniture Association
B. SEFA 8 - Scientific Equipment and Furniture Association
C. NFPA 30 - National Fire Protection Association
D. NFPA-45 - National Fire Protection Association
E. UL - Underwriters Laboratories
F. ASTM D552 - Bending Test

1.4 BASIS OF SPECIFICATION

A. It is the intent of this specification to use Kewaunee Scientific Corporation, RESEARCH COLLECTION Laboratory Furniture as the standard of construction for steel laboratory furniture. The construction standards of this product line shall provide the basis for quality and functional installation.

B. This is not a proprietary specification. Products from other manufacturers, which meet or exceed the criteria listed herein, will be acceptable as equals. While prequalification of substitutions is not required, it remains the responsibility of the bidder to ensure that the products carried in the bid, meet the requirements of this specification.

1. Certain cabinets are being provided by the Owner, for installation by the Contractor. The cabinets being provided are Kewaunee Research Collection. Substitutions shall have an appearance consistent with the Owner-supplied cabinets, such that the renovated laboratories have a uniform appearance.

1.5 QUALITY ASSURANCE

A. All laboratory equipment covered by the specification shall be the product of one manufacturer and be fabricated at one geographic location to assure shipping continuity and single-source responsibility. If requested by the Owner, manufacturer shall submit:

1. List of shop facilities
2. List of engineering and manufacturing personnel
3. Proof of financial ability to fulfill the contract
4. List of a minimum of ten (10) installations over the last five (5) years of comparable scope.
5. Proof of project management and installation capabilities
6. SEFA member in Good Standing

B. The steel laboratory furniture contractor shall also provide worktops and fume hoods all manufactured or shipped from the same geographic location to assure proper staging,
shipment and single source responsibility. Refer to Section 115300 - LABORATORY EQUIPMENT.

C. General Performance: Provide certification that furniture shall meet the performance requirements described in SEFA 8.

1.6 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's data and installation instructions for each type of casework. Provide data indicating compliance with SEFA 8.

B. Samples: Submit the following items:

1. One 18" combination (1) drawer and (1) cupboard base unit showing complete construction details, including (1) shelf.

2. One sample of all top, shelf and upright materials shown or called for, of sufficient size to perform finish requirement tests.

C. Shop Drawings: Submit shop drawings for furniture assemblies showing plans, elevations, ends, cross-sections, service run spaces, location and type of service fittings

1. Coordinate shop drawings with other work involved.
2. Provide roughing-in drawings for mechanical and electrical services when required.

1.7 WARRANTY

A. The manufacturer must warrant for a period of one-year stating (date of acceptance or occupancy, whichever comes first) that all products sold under the contract referenced above shall be free from defects in material and workmanship. Purchaser shall notify the manufacturer's representative immediately of any defective product. The manufacturer shall have a reasonable opportunity to inspect the goods. The purchaser shall return no product until receipt by purchaser of written shipping instructions from the manufacturer.

PART 2 -PRODUCTS

2.1 CABINET STYLE:

A. Cabinet bodies, drawer bodies, shelves, drawer heads and door assemblies shall be fabricated from Cold Rolled Steel, except cabinets in room N311A which shall be stainless steel.

2.2 DRAWER AND DOOR STYLE:

A. Kewaunee Research Collection, Style 02 (inset with flush pulls) - The outer drawer and door head shall have a channel formation on all four sides to eliminate sharp raw edges of steel and shall be welded and ground smooth. Drawer and door, when closed, shall be recessed to create an overall flush face. Drawer and door pulls shall be an integral contour
radiused pull along the top edge.

2.3 MATERIALS

A. Steel:

1. Cold rolled sheet steel shall be prime grade 12, 14, 16, 18 and 20 gauge U.S. Standard; roller leveled. Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches or other injurious effects.

2. Stainless steel shall be Stainless Steel shall be Type 304; 12, 14, 16, 18 and 20 gauge U.S. Standard. Stainless steel shall be supplied with a #4 finish free of burrs, weld marks, or other imperfections

B. Hardware and Trim:

1. Drawer and Door Pulls: integral to doors and drawers.

2. Hinges: Hinges shall be made of Type 304 stainless steel .089 thick, 2-1/2” high, with brushed satin finish, and shall be the institutional type with a five-knuckle bullet-type barrel. Hinges shall be attached to both door and case with two screws through each leaf. Welding of hinges to door or case will not be accepted. Doors 36”, or less, in height shall be hung on one pair of hinges, and doors over 36” high shall be hung on 3 hinges.

3. Positive Catch: Doors shall utilize a two-piece heavy-duty cam action positive catch or nylon roller type catch to hold doors securely in the closed position.

4. Elbow Catches: Elbow catches and strike plates shall be used on left hand doors of double door cases where locks are used, and are to be burnished cast aluminum, with bright brass finish

5. Shelf Adjustment Clips: Shelf adjustment clips shall be nickel-plated steel.

6. Leg Shoes: Leg shoes shall be provided on all table legs, unless otherwise specified, to conceal leveling device. Shoes shall be a pliable, black vinyl material. Use of a leg shoe, which does not conceal leveling device, will not be acceptable.

7. Base Molding: Base molding shall be provided by the resilient flooring filed sub-bidder.

8. Label Holders: Label holders, shall be self adhesive type aluminum with satin finish and designed for 2-1/2” x 1-1/8” cards, unless otherwise specified. Provide one per door or drawer.

9. Sink Supports: Sink supports shall be the hanger type, suspended from top front and top rear horizontal rails of sink cabinet by four 1/4” dia. rods, threaded at bottom end and offset at top to hang from two full length reinforcements welded to the front and
rear top rails. Two 3/4" x 1-2/2" x 12 gauge channels shall be hung on the threaded rods to provide an adjustable sink cradle for supporting sinks. When sink capacity exceeds 3,750 cu. in., the sink supports shall be suspended from full-length reinforcements welded to the two end rails. Two 1" x 2" x 10 gauge full-length channels shall be hung from the four 1/4" dia. rods to provide an alternate sink cradle.

2.4 CONSTRUCTION

A. Steel Base Cabinet Construction:

1. General:

(a) The steel furniture shall be of modern design and shall be constructed in accordance with the best practices of the Scientific Laboratory Equipment Industry. First class quality casework shall be insured by the use of proper machinery, tools, dies, fixtures and skilled workmanship to meet the intended quality and quantity for the project.

(b) All cabinet bodies shall be flush front construction with intersection of vertical and horizontal case members, such as end panels, top rails, bottoms and vertical posts in same plane without overlap. Exterior corners shall be spot welded with heavy back up reinforcement at exterior corners. All face joints shall be welded and ground smooth to provide a continuous flat plane.

(c) Each cabinet shall be complete so that units can be relocated at any subsequent time without requiring field application of finished ends or other such parts.

(d) Case openings shall be rabbetted on all four sides for both hinged and sliding doors to provide a dust resistant case.

(e) All cabinets shall have a cleanable smooth interior. Bottom edges shall be formed down on sides and back to create easily cleanable corners with no burrs or sharp edges, and front edge shall be offset to create a seamless drawer and door recess rabbet for dust stop.

2. Steel Gauges: Gauges of steel used in construction of cases shall be 18 gauge, except as follows:

(a) Corner gussets for leveling bolts and apron corner braces, 12 gauge

(b) Hinge reinforcements, case and drawer suspension channels, 14 gauge.

(c) Top and intermediate front horizontal rails, table aprons and reinforcement gussets, 16 gauge.

(d) Drawer assemblies, door assemblies and adjustable shelves, 20 gauge.

3. Base Cabinets:
(a) End uprights shall be formed into not less than a channel formation at top, bottom, back and front. The front edge shall further offset to form a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws. An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning. The upright filler shall be perforated with shelf adjustment holes at not more than 2” centers painted prior to assembly. The inside front of the upright shall be further reinforced with a full height 14 gauge hinge reinforcement angle.

(b) Top horizontal rail on base cabinets shall interlock within the flange at top of end panels for strength, but shall be flush as face of unit. Top rail shall have a full width rabbet for swinging doors and drawers. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.

(c) Intermediate rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.

(d) Intermediate vertical uprights shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.

(e) Cabinet bottom, and bottom rail shall be formed of one piece of steel except in corner units and shall be formed down on sides and back to create a square edge transition welded to cabinet end panels, and front edge shall be offset to create a seamless drawer and door recess rabbet for dust stop.

(f) Toe space rail shall extend up and forward to engage bottom rail to form a smooth surfaced fully enclosed toe space, 3” deep x 5” high. Whenever toe space base is omitted for units to set on building bases on separate steel bases, then the toe space rail shall extend back 4-1/2”.

(i) End cap units at penninsula ends shall have custom toe spaces on the cabinet sides, matching the toe space for cabinets along the balance of the bench.

(ii) Where foot pedals are shown on Plumbing Drawings for sinks, cut out toe kick accordingly.

(g) Back construction shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, open for access to plumbing lines. Cupboard units only shall be provided with removable back panels.
(h) Die formed gussets, with multiple ends for strength, shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8"-16 leveling bolt, 3" long, shall engage a clinch nut in each gusset. Access to the leveling bolts shall be through plug buttons in the bottom pan. Each leveling bolt and gusset shall be capable of supporting 500 lbs. Access to leveling bolts through toe space or leveling bolts requiring special tools to adjust are not acceptable.

(i) Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and front. They shall be fully coved at interior bottom on all four sides for easy cleaning. The top front of the inner drawer body shall be offset to interlock with the channel formation in drawer head providing a 3/4" thick drawer head.

(j) Drawer suspension assembly shall consist of 2 sections providing a quiet, smooth operation on 100# ball bearing nylon rollers. All drawers shall be self-closing from a point 5" open. Cabinet channels shall maintain alignment of drawer and provide an integral drawer stop, but the drawer shall be removable without the use of tools. Drawers shall provide 13-5/8" front to back clearance when fully extended. Drawers shall rise when opened thus avoiding friction with lower drawers and/or doors. Drawer suspension system shall incorporate a double stop, lock open feature. Case suspension channels shall be Galvanized Steel, drawer suspension channels shall be Cold Rolled Steel. Drawer suspension channels on Stainless Steel Cabinets shall be zinc plated after they are formed.

(k) Steel Door assembly (two-piece) for solid pan swinging doors shall consist of an inner and outer door pan. Outer door pan shall be formed at all four sides. The corners on the pull side of the outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contains sound deadening material.

(l) Steel Drawer/door assemblies shall be painted prior to assembly. Both shall be punched for attaching drawer pulls. Likewise, inner pan formation of door and drawer body shall be indented for in-field installation of locks when required.

(m) Doors shall be readily removable and hinges easily replaceable. Hinges shall be applied to the cabinet and door with screws. Welding of hinges to either cabinet or door will not be acceptable.

(n) Knee space panels, where shown or specified, shall be 18 gauge, finished same as casework cabinets, and easily removable for access to mechanical service areas.

2.5 PERFORMANCE REQUIREMENTS

A. Steel Casework Construction Performance

1. Base cabinets shall be constructed to support at least a uniformly distributed load 200
lbs. per square foot of cabinet top area, including working surface without objectionable distortion of interference with door and drawer operation.

2. Base cabinet corner gussets with leveling bolts shall support 500 lbs. per corner, at 1-1/2" projection of the leveling bolt below the gusset.

3. Each adjustable and fixed shelf 4 ft. or shorter in length shall support an evenly distributed load of 40 lbs. per square ft. up to a maximum of 200 lbs., with nominal temporary deflection, but without permanent set.

4. Drawer construction and performance shall allow 13-5/8" clear when in an extended position and suspension system shall prevent friction contact with any other drawer or door during opening or closing. All drawers shall operate smoothly, a minimum of 10,000 cycles with an evenly distributed load of 150 lbs. Drawer slides shall be independently rated for 150 lbs. each.

5. Swinging doors on floor-mounted casework shall support 200 lbs. suspended at a point 12" from hinged side, with door swung through an arc of 160 degrees. Weight load test shall allow only a temporary deflection, without permanent distortion or twist. Door shall operate freely after test and assume a flat plane in a closed position.

B. Steel Paint System Finish and Performance Specification:

1. Steel Paint System Finish:
   
   (a) After Cold Rolled Steel and Textured Steel component parts have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish system to the steel and to aid in the prevention of corrosion. Physical and chemical cleaning of the steel shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a complex metallic phosphate solution to provide a uniform fine grained crystalline phosphate surface that shall provide both an excellent bond for the finish and enhance the protection provided by the finish against humidity and corrosive chemicals.

   (b) After the phosphate treatment, the steel shall be dried and all steel surfaces shall be coated with a chemical and corrosion-resistant, environmentally friendly, electrostatically applied powder coat finish. All components shall be individually painted, insuring that no area be vulnerable to corrosion due to lack of paint coverage. The coating shall then be cured by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance.

   (c) The completed finish system in standard colors shall meet the performance test requirements specified under PERFORMANCE TEST RESULTS.

2. Performance Test Results (Chemical Spot Tests):

   (a) Testing Procedure: Chemical spot tests for non-volatile chemicals shall be made
by applying 5 drops of each reagent to the surface to be tested and covering with a 1-1/4" dia. watch glass, convex side down to confine the reagent. Spot tests of volatile chemicals shall be tested by placing a cotton ball saturated with reagent on the surface to be tested and covering with an inverted 2-ounce wide mouth bottle to retard evaporation. All spot tests shall be conducted in such a manner that the test surface is kept wet throughout the entire test period, and at a temperature of 77° ±3° F. For both methods, leave the reagents on the panel for a period of one hour. At the end of the test period, the reagents shall be flushed from the surface with water, and the surface scrubbed with a soft bristle brush under running water, rinsed and dried. Volatile solvent test areas shall be cleaned with a cotton swab soaked in the solvent used on the test area. Immediately prior to evaluation, 16 to 24 hours after the reagents are removed, the test surface shall be scrubbed with a damp paper towel and dried with paper towels.

(b) Test Evaluation: evaluation shall be based on the following rating system. After testing, panel shall show no more than three (3) Level 3 conditions.

Level 0 - No detectable change.
Level 1 - Slight change in color or gloss.
Level 2 - Slight surface etching or severe staining.
Level 3 - Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

(c) Test Reagents

<table>
<thead>
<tr>
<th>Test Chemical Reagent</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Acetate, Amyl</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>2. Acetate, Ethyl</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>3. Acetic Acid, 98%</td>
<td>Watch glass</td>
</tr>
<tr>
<td>4. Acetone</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>5. Acid Dichromate, 5%</td>
<td>Watch glass</td>
</tr>
<tr>
<td>6. Alcohol, Butyl</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>7. Alcohol, Ethyl</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>8. Alcohol, Methyl</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>9. Ammonium Hydroxide, 28%</td>
<td>Watch glass</td>
</tr>
<tr>
<td>10. Benzene</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>11. Carbon Tetrachloride</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>12. Chloroform</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>13. Chromic Acid, 60%</td>
<td>Watch glass</td>
</tr>
<tr>
<td>14. Cresol</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>15. Dichlor Acetic Acid</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>16. Dimethylformanide</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>17. Dioxane</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>18. Ethyl Ether</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>19. Formaldehyde, 37%</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>20. Formic Acid, 90%</td>
<td>Watch glass</td>
</tr>
<tr>
<td>21. Furfural</td>
<td>Cotton ball &amp; bottle</td>
</tr>
<tr>
<td>22. Gasoline</td>
<td>Cotton ball &amp; bottle</td>
</tr>
</tbody>
</table>
23. Hydrochloric Acid, 37%  Watch glass
24. Hydrofluoric Acid, 48%  Watch glass
25. Hydrogen Peroxide, 3%  Watch glass
26. Iodine, Tincture of  Watch glass
27. Methyl Ethyl Ketone  Cotton ball & bottle
28. Methylene Chloride  Cotton ball & bottle
29. Mono Chlorobenzene  Cotton ball & bottle
30. Naphthalene  Cotton ball & bottle
31. Nitric Acid, 20%  Watch glass
32. Nitric Acid, 30%  Watch glass
33. Nitric Acid, 70%  Watch glass
34. Phenol, 90%  Cotton ball & bottle
35. Phosphoric Acid, 85%  Watch glass
36. Silver Nitrate, Saturated  Watch glass
37. Sodium Hydroxide, 10%  Watch glass
38. Sodium Hydroxide, 20%  Watch glass
39. Sodium Hydroxide, 40%  Watch glass
40. Sodium Hydroxide, Flake  Watch glass
41. Sodium Sulfide, Saturated  Watch glass
42. Sulfuric Acid, 33%  Watch glass
43. Sulfuric Acid, 77%  Watch glass
44. Sulfuric Acid, 96%  Watch glass
45. Sulfuric Acid, 77% and Nitric Acid, 70%, equal parts  Watch glass
46. Toluene  Cotton ball & bottle
47. Trichloroethylene  Cotton ball & bottle
48. Xylene  Cotton ball & bottle
49. Zinc Chloride, Saturated  Watch glass

* Where concentrations are indicated, percentages are by weight.

3. Performance Test Results (Heat Resistance):

   (a) Hot water (190° F - 205° F) shall be allowed to trickle (with a steady stream at a rate not less than 6 ounces per minute) on the finished surface, which shall be set at an angle of 45° from horizontal, for a period of five minutes. After cooling and wiping dry, the finish shall show no visible effect from the hot water treatment.

4. Performance Test Results (Impact Resistance):

   (a) A one-pound ball (approximately 2" diameter) shall be dropped from a distance of 12 inches onto the finished surface of steel panel supported underneath by a solid surface. There shall be no evidence of cracks or checks in the finish due to impact upon close eye-ball examination.

5. Performance Test Results (Bending Test):

   (a) An 18 gauge steel strip, finished as specified, when bent 180° over a 1/2" diameter mandrel, shall show no peeling or flaking off of the finish.
6. Performance Test Results (Adhesion):

   (a) Ninety or more squares of the test sample shall remain coated after the scratch adhesion test. Two sets of eleven parallel lines 1/16" apart shall be cut with a razor blade to intersect at right angle thus forming a grid of 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. They shall then be brushed lightly with a soft brush. Examine under 100 foot-candles of illumination. Note: This test is based on ASTM D2197-68, "Standard Method of Test for Adhesion of Organic Coatings".

7. Performance Test Results (Hardness):

   (a) The test sample shall have a hardness of 4-H using the pencil hardness test. Pencils, regardless of their brand are valued in this way: 8-H is the hardest, and next in order of diminishing hardness are 7-H, 6-H, 5-H, 4-H, 3-H, 2-H, F, HB, B (soft), 2-B, 3-B, 4-B, 5-B (which is the softest).

   (b) The pencils shall be sharpened on emery paper to a wide sharp edge. Pencils of increasing hardness shall be pushed across the paint film in a chisel-like manner until one is found that will cut or scratch the film. The pencil used before that one—that is, the hardest pencil that will not rupture the film—is then used to express or designate the hardness.

8. Stainless Steel cabinets shall be natural finish, un-primed and un-painted.

2.6 TABLES

A. General: all tables shall be constructed of cold rolled steel frames with a factory finish matching the finish of other new casework provided within the room, and an epoxy worksurface of a color matching the bench worksurfaces within the room.

B. Fixed Height Tables: where fixed height tables are shown within the labs, provide the following:

1. Leg assemblies: 2" square, 35-3/4" high, 22-3/16" and 18-3/16" deep, to suit worksurface size noted on Drawings.
2. Box Aprons: provide box apron frames with (2) pencil drawers per frame, at each table.
3. Spreaders: provide a spreader between the bottom rails of each leg assembly, at all tables, regardless of their length. Install spreader to the rear of the leg assembly, to permit under-table storage of equipment.
4. Worksurface: epoxy resin, dimensions as noted on Drawings, 1" thick. Worksurface shall overhang ends of table by 1".

C. Adjustable Height Tables: where adjustable height tables are shown at the end of fixed lab benches, provide the following:
1. Table Frame: 28" deep, 34", 46", 52" in length depending on location, with telescoping legs that are height adjustable from 30" - 37" in 1" increments.

2. Worksurface: 30" deep x 42", 48" or 54" long to suit table frame, 1" thick.

3. Moveable base cabinet: each adjustable table shall include (1) moveable base cabinet Kewaunee D81M312218 at 46" tables and D81M312224 at 52" tables.
   (a) Include steel mobile cabinet finished tops on all moveable cabinets.

4. Suspended drawers: include (1) suspended drawer, 4" high x maximum width accommodated by moveable cabinet.

2.7 WORKSURFACES AND BACKSPLASHES

A. Epoxy Resin Tops (KEMRESIN): Epoxy Resin tops shall consist of modified epoxy resin that has been especially compounded and cured to provide the optimum physical and chemical resistance properties required of a heavy-duty laboratory table top. Tops and curbs shall be a uniform mixture throughout their full thickness, and shall not depend upon a surface coating that is readily removed by chemical and/or physical abuse. Tops and curbs shall be non-glaring.

1. Thickness: 1"

2. Top edge: Marine, added to the base thickness for a total thickness of 1-1/4" at edges. Provide marine edge at all counters except for sitting height counters.

3. Bottom edge: beveled outside corner, with a drip kerf.

4. Sink cutouts shall be smooth and uniform without saw marks with the top edge beveled. The bottom edge of the sink opening shall be finished smooth with the edge broken to prevent sharpness. Corners of sink cutouts shall be radiused not less than 3/4".

5. Fabricator shall bore all holes as required by the plumber, for the installation of faucets, valves, strainers, etc.


7. Support brackets: RAKKS model EH 1824, or approved equal.
   (a) Finish: mill aluminum.

B. Physical Properties:

1. Flexural Strength (A.S.T.M. Method D790-90) ......................... 15,000 PSI
2. Compressive Strength (A.S.T.M. Method D695-90) .................. 30,000 PSI
3. Hardness, Rockwell E (A.S.T.M. Method D785-89) ........................................ 100
4. Water Absorption (A.S.T.M. Method D570-81)% by weight, 24 Hours .......... 0.04
5. % by weight, 7 Days ........................................................................ 0.05
6. % by weight, 2 Hour Boil .................................................................. 0.04
7. Specific Gravity .................................................................................. 1.97
8. Tensile Strength .................................................................................. 8,500 PSI

C. Performance Test Results (Heat Resistance): A high form porcelain crucible, size 0, 15 ml capacity, shall be heated over a Bunsen burner until the crucible bottom attains an incipient red heat. Immediately, the hot crucible shall be transferred to the top surface and allowed to cool to room temperature. Upon removal of the cooled crucible, there shall be no blisters, cracks or any breakdown of the top surface whatsoever.

D. Performance Test Results (Chemical Resistance): Tops shall resist chemical attacks from normally used laboratory reagents. Weight change of top samples submerged in normally used laboratory reagents for a period of seven (7) days shall be less than one-tenth of one percent, except that the weight change for those reagents marked with ** shall be less than one percent. (Tests shall be performed in accordance with A.S.T.M. Method D543-67 at 77o F.).

E. Backsplashes and side splashes shall be provided along all worksurfaces. Material shall be epoxy resin, to match worksurface, and shall be bonded to the worksurface with epoxy.

F. Worksurfaces, back and side splashes, shelving and uprights shall all match in color.

2.8 STAINLESS STEEL WORKSURFACES

A. Stainless steel worksurfaces shall be fabricated with a 1-1/4" nosing which includes a 1/4" marine edge profile similar in appearance to the epoxy worksurfaces.

B. Backsplashes and sidesplashes shall be 4" tall with a 1" return to meet walls, bent integrally with the worksurface itself. Loose, field applied back and side splashes are not permitted.

C. Counters shall be fabricated without seams, to the greatest extent possible. Where seams are required, they shall be fully welded and ground smooth.

2.9 UPRIGHTS AND SHELVING

A. Shelving and custom uprights shall be fabricated from solid Phenolic, constructed of a cellulose fiber reinforced phenolic resin core with a polyurethane copolymer surface. Joinery shall be by predrilled and countersunk screws.

2. Fixed shelves shall be 1" thick.
3. Adjustable shelves and uprights shall be 3/4" thick.

B. Shelf pins shall be steel, 1/4" diameter L type, Knape & Vogt #346 or approved equal
C. Shelf brackets shall be heavy duty commercial, 12 gauge steel, three-tab brackets for 2" adjustment, with integral cam locks and white powder coated finish, Knape & Vogt 187 or approved equal.

1. Provide one bracket per shelf per standard.

D. Standards for adjustable shelving shall be 7/8" x 11/16" heavy duty steel wall mounted standards, specifically designed for use with the specified brackets, with white powder coated finish, Knape & Vogt 87 or approved equal.

1. Provide one standard per 3'-0" of shelf, or a minimum of two standards.

E. Clips and stiffeners for shelving between lab bench uprights where detailed, shall be 16 gauge type 304 stainless steel.

2.10 SINKS, CUP SINKS AND DRAINS

A. Sinks shall be molded of modified epoxy resin, carefully compounded with selected materials to provide maximum physical and chemical properties. Sinks shall be non-glaring with all inside corners coved and the bottom pitched to the drain outlet. Sinks shall possess a high resistance to mechanical and thermal shock.

1. Sinks in room N311A shall be stainless steel.

B. Sinks shall be drop-in type, set on rabbeted lips in worksurfaces such that the sink edge is flush with, or lower than, the adjacent worksurface. Sink rims which are raised above the worksurface will not be acceptable.

C. Cup sinks shall be oval, black poly, sizes as listed in the schedule at the end of this section.

D. Fittings shall be furnished and installed under Division 22.

PART 3 -EXECUTION

3.1 SITE EXAMINATION

A. The contractor shall assure all building conditions conducive to the installation of a finished goods product; all critical dimensions and conditions previously checked have been adhered to by other contractors (general, mechanical, electrical, etc.) to assure a quality installation.

B. Where owner-supplied casework is indicated, the installing contractor shall visit the rooms where the casework is stored, and shall inspect the casework for existing damages or for missing cabinets, at the start of the project. Any conditions which require correction shall be brought to the attention of the resident engineer immediately.

3.2 INSTALLATION, CASEWORK
A. Preparation: Prior to beginning installation of casework, check and verify that no irregularities exist that would affect quality of execution of work specified.

B. Coordination: coordinate the work of the Section with the schedule and other requirements of other work being prepared in the area at the same time both with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.

C. Set casework components plumb, square, and straight with no distortion and securely anchor to building structure. Shim as required using concealed shims.

D. Bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance.

E. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.

F. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8".

3.3 WORKSURFACES:

A. Install worksurfaces plumb and level. Maximum deviation permitted is 1/16" per foot. Shim or adjust cabinetry installation as required to achieve uniform installation.

B. Ensure that drip kerfs in the underside of the worksurface hang out past cabinet faces.

C. Fabricate worktops in the longest lengths possible, avoiding seams. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure the joints in the field, where practical, in the same manner as in the factory. Where seams are required, butt worktop sections tightly together, and adhere with epoxy, colored to match the tops. Clean any squeeze-out and buff top to a uniform appearance.

D. Where required due to field conditions, scribe to abutting surfaces. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure the joints in the field, where practical, in the same manner as in the factory. Secure work surfaces to casework and equipment components with materials and procedures recommended by the manufacturer.

E. Install back and side splashes in the longest lengths possible, with corners and edges square to other construction. Join all pieces with epoxy, and join to worksurfaces with epoxy, colored to match the worksurfaces. Caulk all joints where splashes abut walls, and tool to a smooth void free finish.

F. Secure worksurfaces to casework and equipment components with materials and procedures recommended by the manufacturer.

G. Where worksurfaces are shown to be installed without base cabinets below them, support worksurfaces with support brackets, anchored to wall construction or concealed blocking such that counters will support a minimum weight of 400 pounds per bracket.
1. Install brackets 32" on center, or as dimensioned on Drawings.
2. Secure with a minimum of (3) #14 screws, or as required by manufacturer.

3.4 LAB BENCH UPRIGHTS

A. Fabricate custom lab bench uprights from approved shop drawings, providing all cleats and supports required for the complete installation.

B. Drill and machine phenolic as required by other trades for the installation of outlets, data jacks, gas cocks, lighting, and all other integrated components.

C. Drill, deburr and countersink holes for shelf pins, fasteners, etc.

D. Fabricate components square and true, install plum and level. Joinery to be tight and aligned, without gaps or overlaps where panels meet. Set hollow uprights in a bed of silicone sealant, to prevent benchtop spills from leaching into concealed areas.

E. Install adjustable shelving over lab bench at height required by Owner, and secure shelves to shelf pins with screws, to prevent shelf movement or overturning.

F. Firestop tops of hollow uprights, above the ceiling, after installation of lab bench utilities.

3.5 ADJUST AND CLEAN:

A. Repair or remove and replace defective work, as directed by owner and/or his representative upon completion of installation.

B. Adjust doors, drawers and other moving or operating parts to function smoothly.

C. Clean shop finished casework; touch up as required.

D. Clean worksurfaces and leave them free of all grease and streaks.

E. Casework to be left broom clean and orderly.

3.6 PROTECTION:

A. Provide reasonable protective measures to prevent casework and equipment from being exposed to other construction activity.

B. Advise owner and/or his representative of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

3.7 SCHEDULE OF CASEWORK

A. This schedule identifies major casework components depicted on the Drawings. Bidders shall include as part of the casework package, all filler pieces, trim strip, closures, panels,
clips, angles, fasteners and all other hardware required for a complete installation.

B. Cabinets identified on the Drawings with numerical tags are existing cabinets on site, furnished by the Owner, for installation by the Contractor.

C. Tag      Kewaunee # Notes
   A D81M312218
   B D81M312224
   C Adjustable height table assembly - see 2.06
   D D30M372218
   E E40M372218
   F E40M372212
   G G00M372230
   H D30M372230
   I E40M372224
   J D30M372224
   K G68M3730-0100 Cabinet to vent around hood and tie into fume hood exhaust duct
   L G80m372230 Include PVC vent pipe to vent cabinet into hood
   M W25M361618
   N W00M301630

D. Laboratory Sinks:

   Sink Type A  1005-DI-BK, Kemresin, Drop-in, 15"x15"x10" inside dimensions
   Sink Type B  F-5355-11, Stainless Steel, Drop-in, 19"x16"x10-1/2" inside dimensions

   **Break room kitchenette sink to be furnished/installed by plumbing sub-contractor.**

E. Other Accessories:

   1. Lab gas cylinder securement bracket: USA Safety, Global Industries, First Safety Corporation or approved equal meeting the following:

      (a) OSHA, UFC, NFPA & CGA Compliant.
      (b) Cylinder Restraint Bracket: 11 gauge hot rolled steel with power paint finish.
      (c) Cylinder Securement: 1.5" Polypropylene strap & steel cinch buckle or Chain Set
      (d) Number of Cylinder Brackets: As shown on the Drawings.

   2. Lab Pegboards: Kewaunee X-020014 with s.s. drip tray and hose. Secure all peg in holes with clear silicone.

END OF SECTION
SECTION 220001

PLUMBING

(Filed Sub-Bid Required)

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PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the University of Massachusetts at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

<table>
<thead>
<tr>
<th>NAME OF SUB-BIDDER: (Insert legal name of sub-bidder)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.M.A Project: U.M.A 17-10</td>
</tr>
<tr>
<td>U.M.A. PROJECT: Morrill I and IV North 1st and 3rd Floor Microbiology Consolidation</td>
</tr>
<tr>
<td>SUB-BID FOR SECTION: 220001 - Plumbing</td>
</tr>
</tbody>
</table>

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the Commonwealth of Massachusetts General Laws, as amended. Sub-bid forms may be obtained at the Procurement website: [http://www.umass.edu/procurement/constructionprojects.htm](http://www.umass.edu/procurement/constructionprojects.htm).

3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the University of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements:

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-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub trade 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.

<table>
<thead>
<tr>
<th>CLASSES OF WORK</th>
<th>REFERENCE PARAGRAPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation</td>
<td>2.6</td>
</tr>
</tbody>
</table>

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

- **P0.1 PLUMBING SCHEDULES, DETAILS & LEGEND**
- **P0.2 PLUMBING DETAILS**
- **P1.0 BASEMENT LEVEL PLUMBING PLAN - DEMOLITION**
- **P1.1 FIRST FLOOR PLUMBING PLAN - DEMOLITION**
- **P1.2 SECOND FLOOR PLUMBING PLAN - DEMOLITION**
- **P1.3 THIRD FLOOR PLUMBING PLAN - DEMOLITION**
- **P2.0 BASEMENT LEVEL PLUMBING PLAN - NEW WORK**
- **P2.1 FIRST FLOOR PLUMBING PLAN - NEW WORK**
- **P2.2 FIRST FLOOR PLUMBING Plan - NEW LAB CYLINDER GAS PIPING**
- **P2.3 SECOND FLOOR PLUMBING PLAN - NEW WORK**
- **P2.4 THIRD FLOOR PLUMBING PLAN - NEW WORK**
- **P2.5 THIRD FLOOR PLUMBING PLAN - NEW LAB CYLINDER GAS PIPING**

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. Domestic cold water system connecting to each and every fixture and piece of equipment requiring domestic cold water.
2. Domestic hot water and hot water return system connecting to each and every fixture and piece of equipment requiring domestic hot water.
3. Sanitary waste and vent system connecting to each and every fixture and piece of equipment requiring sanitary drainage.
4. LP gas system connecting to each and every outlet and appliance requiring natural gas, including a new master gas shut-off valve in each Lab space.
5. Non-potable cold water, hot water and hot water return system connecting to each and every fixture and piece of equipment requiring non-potable water.
6. Tempered water piping to all emergency showers, eyewashes and handwashing sinks.
7. RO water piping to all indicated fixtures.
8. Acid resisting waste and vent system connecting to each and every fixture and piece of equipment requiring acid resisting drainage.
9. Laboratory compressed air system throughout the building connecting to each and every outlet and appliance requiring compressed air.
10. Alterations, additions and/or removal of existing plumbing systems and fixtures within the renovated area in order to conform to new space requirements.

11. Valves.

12. Install new shut-off valves on existing cold water, hot water, hot water recirc, compressed air, RO water and LP gas pipe mains in First Floor Corridor and Third Floor Corridor.

13. Floor drains.


15. Hangers, supports and attachments.

16. Sundries.

17. Core drilling for the Work of this Section.

18. Certified seismic restraints to meet the Commonwealth of Massachusetts Building Code applicable at the time the building permit is issued.

19. Coordination drawings and record drawings and similar requirements.

20. Hoisting equipment for the Work of this Section.

21. Coordination with General Contractor for use of staging, planking and scaffolding, interior and exterior, which is the responsibility of the General Contractor as specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:

1. Section 092116 - GYPSUM BOARD ASSEMBLIES:
   a. Access doors in gypsum board assemblies.

2. Section 095113 - ACOUSTICAL PANEL CEILINGS:
   a. Access doors in acoustical panel ceilings.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 078413 - FIRESTOPPING for coordination of floor and wall penetrations with firestopping contractor.

2. Section 092116 - GYPSUM BOARD ASSEMBLIES for coordination with gypsum ceilings.

3. Section 095113 - ACOUSTICAL PANEL CEILINGS for coordination with acoustical ceilings.

4. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING for coordination with HVAC piping and ductwork and for condensate drains.

F. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
G. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

H. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

1.3 SUBMITTALS

A. Comply with requirements specified in Section 013300 - SUBMITTAL REQUIREMENTS.

B. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:

1. Plumbing fixtures and trim.
2. Floor drains.
3. Hose bibbs and wall hydrants.
4. Piping.
5. Fittings, unions, flanges, and couplings.
6. Insulation.
7. Valves, regulators and meters.
8. Water hammer arrestors.
9. No-hub couplings.
11. Vibration isolation and flexible connections.
12. Pressure reducing station.
13. Access panels and doors.
15. Laboratory Faucets, Gas Outlets & Accessories.

C. This contractor shall include the Massachusetts State Plumbing Board Product Approval number for each product as part of the submittal.

D. Hanger Pull-Out Testing Submittals and Requirements: Hangers and supports will be tested for pull-out by the Independent Testing Agency designated by the UMA Project Manager. Comply with the requirements of Section 014325 - TESTING AGENCY SERVICES and the following:

1. Trade Contractor’s Documentation Prior to Testing:
   a. Submit manufacturer’s name and model number for each type of hanger and support proposed for use, and technical data including type, load capacity, test reports, methods for installation, and use limitations.
   b. Submit a schedule for each type of hanger and support indicating where units for testing will be installed, including substrate, and materials to be supported.
c. Submit a letter from Trade Contractor indicating supports have been installed in accordance with manufacturer’s recommendations and project requirements, and are ready for testing.

2. Independent Testing Agency’s Documentation Prior to Testing for Trade Contractor’s Information:
   a. Submit the methods and type of equipment which will be used to test hangers and supports.
   b. Submit loads which will be applied, and criteria for acceptance or failure of hangers and supports.

3. Quantity to Be Installed by Trade Contractor for Testing: Two of each size of each type of hanger or support.

4. Testing Results: The Independent Testing Agency will submit reports indicating test results.
   a. Units which did not deform or fail during testing may remain in place.
   b. Units which failed during testing shall be replaced and testing repeated until satisfactory results are obtained.
   c. Cost of repeat testing will be at the expense of the Trade Contractor.
   d. Contractor shall repair damaged substrates, if any.

1.4 DEFINITIONS

A. As used in this Section, "provide" means "furnish and install" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

1.5 CONTRACT DOCUMENTS

A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, HVAC, Plumbing, Fire Protection, Electrical, Structural, and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components,
and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.

E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.

F. Data that may be furnished electronically by the Designer (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Designer's sealed or stamped construction documents.

1.6 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.

B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.

C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.

D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with the paragraph above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

E. In cases covered by the paragraph above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.7 MODIFICATIONS IN LAYOUT

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.
B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.

C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.

D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.

E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.8 SITE VISIT

A. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer.

1.9 EXISTING CONDITIONS AND PREPARATORY WORK

A. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by User Agency. Report conditions that might affect work adversely in writing through Contractor to Designer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.10 CODES, STANDARDS, AUTHORITIES AND PERMITS

A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
2. American Gas Association (AGA).
5. Occupational Safety and Health Act (OSHA).
6. Factory Mutual Association (FM) if applicable to project.
7. Underwriters' Laboratories (UL).
9. Compressed Gas Association (CGA).
10. Canadian Standards Association (CSA).

B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.

C. When requirements cited in this Specification conflict with each other or with Contract Documents, most stringent shall govern work. Designer may relax this requirement when such relaxation does not violate ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing.

D. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:

2. American Society of Mechanical Engineers (ASME).
5. American Water Works Association (AWWA).
6. Thermal Insulation Manufacturers Association (TIMA).
7. Institute of Electrical and Electronics Engineers (IEEE).
8. Insulated Cable Engineers Association (ICEA).

E. Special attention is directed to requirements of NFPA 45, Laboratories Using Chemicals.

F. All Plumbing and Gas products shall be approved by the Massachusetts State Plumbing Board.

1.11 GUARANTEE AND 24 HOUR SERVICE

A. Guarantee Work of this Section in writing for one year following the date of Substantial Completion. If the equipment is used for ventilation, temporary heat, etc. prior to Substantial Completion, the bid price shall include an extended period of warranty covering the one-year of occupancy, starting from the initial date of Substantial Completion. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in User Agency's name.
C. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.

D. Provide 24 hour emergency service beginning on the date the project is first occupied for public use by the User Agency, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to UMA. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and UMA’s Project Manager approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.

E. Submit copies of equipment and material warranties to Designer before final payment.

F. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to User Agency.

G. This Paragraph shall not be interpreted to limit UMA’s Project Manager's rights under applicable codes and laws and under this Contract.

H. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph.

I. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use by User Agency, and shall not institute guarantee period.

J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to UMA’s Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will suggest course of action.

1.12 RECORD DRAWINGS

A. Comply with requirements specified in Section 017700 - CONTRACT CLOSEOUT.

B. All "main air" pneumatic control piping routing locations must be shown on the record drawings.

C. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.13 BULLETINS, MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field-assembled units, including as built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock...
or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:

1. **Directions for and sequence of operation of each item of Plumbing systems.** Sequence shall list valves, switches, and other devices used to start, stop and control system. Include approved valve directory showing each valve number, location of each valve, and equipment or fixture controlled by valve.

2. **Detailed maintenance and trouble shooting manuals containing data furnished by manufacturer for complete maintenance.** Include copy of balancing report.

3. **Lubrication instructions detailing type of lubricant, amount, and intervals recommended by manufacturer for each item of equipment.** Include additional instructions necessary for implementation of first class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.

B. **Furnish three copies of manuals to Designer for approval and distribution to UMA’s Project Manager.** Deliver manuals no less than 30 days prior to acceptance of equipment to permit User Agency's personnel to become familiar with equipment and operation prior to acceptance.

C. **Provide framed and glazed charts as follows: mount as directed by Designer.**

   1. Flow diagrams from first part of manual as described above.
   2. Valve directory.
   3. Lubrication chart from third part of manual.

D. **Operating instructions:** Upon completion of installation or when UMA’s Project Manager accepts portions of building and equipment for operational use, instruct User Agency's operating personnel in any or all parts of various systems. Instructions shall be performed by factory trained personnel. User Agency shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.

E. Each contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.

F. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

1.14 **COORDINATION DRAWINGS**

A. **Refer to Section 013100 - PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements.**

B. **Coordination Drawings include but are not necessarily limited to:**

   1. Structure.
2. Partition/room layout.
3. Ceiling tile and grid.
4. Light fixtures.
5. Access panels.
6. Sheet metal, heating coils, boxes, grilles, diffusers, etc.
7. All heating piping and valves.
8. Smoke and fire dampers.
9. Soil, waste and vent piping.
10. Major water and medical gases.
11. Roof drain piping.
12. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
13. Above ceiling miscellaneous metal.
14. Sprinkler piping and heads.
15. Heat tracing of piping.

1.15 STARTERS AND CONTROLLERS

A. Motor driven equipment supplied under this Section shall be operated by starters furnished and installed under Section 260001 - ELECTRICAL WORK, except for starters integral with Plumbing equipment which shall be provided by the Plumbing Contractor. Starters provided by the Plumbing Contractor shall meet all requirements of the Electrical Sections of the Specifications.

B. The Plumbing Contractor shall provide nameplates on all starters furnished under Section 260001 - ELECTRICAL WORK and this Section for use on equipment provided under this Section.

C. All motor controls shall conform to NEMA Standards and be the product of a single manufacturer; Arrow-Hart and Hageman, Allen-Brady, or Square D.

D. Auxiliary contacts shall be included in all starters provided under Section 260001, ELECTRICAL WORK, for integrally mounted starters. Auxiliary contacts shall be provided for all interlocking wiring.

E. Starters shall normally be provided with two sets of contactors; one set normally open and one set normally closed. Interface shall be provided for all starters and other devices as noted herein.

F. Starters and contactors factory-built into the control panel of packaged equipment will be considered as an integral part of the package.

G. All starters, disconnects and control devices shall be clearly labeled with black lamacoid plates with engraved white letters, to indicate User Agency’s identification number, function and the equipment which they control. Submit list of labels for review.

H. Enclosures for starters included with packaged equipment shall be NEMA Class 1 where installed indoors, NEMA Class IV, where installed outdoors, mechanical rooms or where indicated as weatherproof.

April 2017
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1.16 ELECTRICAL MOTOR CHARACTERISTICS

A. Electrical motors shall conform to the requirements of IEEE, NEMA, U.L., K.E.C., F.M. and NFPA suitable for load conditions, squirrel cage, 1.15 service factor, drip proof, 1750 rpm unless otherwise noted, with inherent overload protection and pressure lubricated bearings with grease fittings. Provide totally enclosed fan cooled motors as noted within the specifications. Refer to ELECTRICAL CHARACTERISTICS REQUIREMENTS of Section 260001 - ELECTRICAL WORK.

B. Motors below 2 HP shall be 120V - 1 phase. Motors that are 1/2 HP and greater shall be in accordance with the electrical requirements. (Verify with Elec.) Motors shall be designed for use with across-the-line starters. Motors to be provided with overload protection. Provide two speed motors where noted on the drawings. Phase protection shall be provided on motors 1/2 HP and larger.

C. Motor leads shall be permanently identified and supplied with connectors.

D. The minimum requirement for three phase motors shall be NEMA Design B, Class B, insulated for a maximum 40 degree C (104 degrees F) ambient.

E. Select motors for quiet, continuous operation to suit loads which may be imposed by equipment. Recognize that motor horsepowers specified and scheduled are minimum sizes. If larger motors, starters, power wiring and additional control wiring are included in bid.

F. Submit an accurate schedule of all motors. Include for each motor, the HP, RPM, nameplate, voltage current, equipment served, location, electrical characteristics and identification number.

PART 2 - PRODUCTS

2.1 PIPING, FITTINGS AND JOINTS

A. General:

1. Pipe and fittings shall conform to the latest ANSI, ASTM, NFPA and AWWA Standards including latest amendments.
2. Each length of pipe, each pipe fitting, trap, material and/or device used in the respective system shall have cast, stamped or indelibly marked on it, the maker's name or mark, weight and quality of the product when such marking is required by the approved standard that applies.
3. Piping and fittings shall be factory coated.
4. Pro-press type piping and fittings may be used, on domestic water and compressed air piping, 4 inches or less in diameter.

B. Acid Waste and Vent Piping
1. Piping and fittings shall be as manufactured by R.G. Sloane, Enfield, Orion or approved equal.
2. Piping shall be Schedule 40 polypropylene with electrical heat fusion type fittings.
3. Provide transition couplings between polypropylene and glass piping.

C. Storm Drainage Piping Above Floor

1. Piping shall be no-hub service weight cast iron soil pipe except at cleanouts and joints just prior to exiting the building which shall be service weight hub and spigot with lead and oakum joints.
2. Couplings for joining no-hub cast iron soil pipe: Couplings shall have a shield constructed of corrugated 304 stainless steel and provide a shield thickness of 0.16 inches or greater. Shield shall be a minimum width of 3 inches for pipe sizes 1-1/2 inch through 4 inch, and a minimum width of 4 inches for pipe sizes 5 inch through 10 inches. Couplings with at least 4 sealing bands shall require 80 inch pounds of torque per band. Tightening screws shall be 3/8 inch hexagon head. Couplings with only 2 sealing bands on sizes 1-1/2 inch through 4 inches shall require 125 inch pound of torque per band. Gaskets shall be neoprene rubber conforming to ASTM C-564.

D. Water Piping (Domestic, Non-Potable and Tempered)

1. Above Ground
   a. 1-1/2 inches and smaller shall be hard drawn Type K copper with push-to-connect fittings. Fittings shall be ASME B16.18 cast copper alloy or ASME B16.22 wrought copper with stainless steel teeth and EPDM synthetic rubber o-ring seal in each end (UL classified in accordance with NSF-61 for hot (+180°F) and cold (+86°F) potable water service) with push-to-connect ends instead of solder-joint ends.
   b. 2-1/2 inches and smaller shall be hard drawn Type K copper with wrought or cast copper fittings.
   c. 2 inches and larger may be hard drawn Type K copper with Victaulic or approved equal by Grinnell or Anvil Gruvlok roll grooved mechanical couplings.
      1) Victaulic or approved equal by Grinnell or Anvil Gruvlok grooved end fittings shall be ASME B16.22 wrought copper or ASME B16.18 bronze castings with copper tubing sized grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
      2) Couplings shall be “Installation Ready” stab-on design for direct “stab” installation onto roll grooved copper tube without prior field disassembly and no loose parts. Coupling shall consist of two ductile iron housings cast with offsetting, angle-pattern bolt pads coated with copper-colored enamel, pressure-responsive, synthetic rubber gasket (Grade “EHP” EPDM), and plated steel bolts and nuts. Victaulic Style 607 QuickVic or approved equal by Grinnell or Anvil Gruvlok.
      3) Flange adapters shall be copper tube dimensioned, ductile iron casting coated with copper-colored enamel, flat face, designed for direct connection to ANSI Class 125 and 150 flanged components. Victaulic Style 641 or approved equal by Grinnell or Anvil Gruvlok.
d. Joints in copper tubing except as otherwise specified herein shall be made according to manufacturer's specifications using sweat fitting and lead free solder and non-corrosive flux.
e. Provide galvanized malleable iron unions, with bronze facings conforming to ANSI B16.39 for sizes 2 inch and smaller.
f. Provide steel flanges conforming to ANSI B16.5, standard or welding neck pattern.

E. LP Gas and Gas Relief Vents

1. 2 inches and smaller shall be Schedule 40 black steel pipe with malleable iron threaded cast fittings ASTM B16.3, Class 150.
2. 2-1/2 inches and larger shall be schedule 40 black steel pipe in accordance with ASTM A.53 with butt welding fittings in accordance with ANSI B16.9.
3. Gas piping at equipment shall be provided with additional supports.
4. All work shall be installed in strict accordance with the Massachusetts State Gas Code.
5. Welders Qualifications (Natural Gas System): Qualifications of the procedure and of the welding operations and welders shall be as specified in American Welding Society, AWS D10.9-80, "Specification for Qualification of Welding Procedures and Welders for Pipe and Tubing"; ANSI B31.1 and ASME Boiler Code, Section 1X.
   a. The Contractor shall provide certification in writing that the operator or welder has met the above prescribed standard. UMA's Project Manager reserves the right to radio graphically test a minimum of 5% of the welds. Comply with requirements of Section 014325 - TESTNG AGENCY SERVICES.

F. Lab Cylinder Gas Piping:

1. Shall be cleaned hard temper **Type K** seamless copper hard-drawn, washed and capped.
2. All lab gas piping shall be installed as per Oxygen quality installation standards to assure oil-free tubing.
3. ASTM B-819, piping components including pipe, valves, and fittings shall be cleaned according to CGA Pamphlet G.4.1.
4. All laboratory gas pipe fittings shall be Swagelok type. Brazing of cylinder gas piping is not acceptable.
5. The flexible gas tubing between hard pipe termination and cylinder regulator shall be provided by the Owner.

G. Process (R.O.) Water Piping:

1. Shall be Type 1, Grade 1 PVC meeting ASTM Standard D 1784 and D 1785, Schedule 80 with iron pipe size cement fusion joints throughout.

H. Compressed Air Piping:

1. Shall be Type-K washed and capped hospital clean, hard drawn copper piping assembled with hospital clean wrought copper fittings and brazing or Phosco.

I. Vacuum Piping:

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1. Shall be cleaned hard temper Type K seamless copper hard-drawn, washed and capped, wrought copper Y-pattern fittings and silver brazed or 95-5 solder joints.

   a. Silver brazing alloys for dissimilar metals shall be cadmium free: AWS BAg-1.
   b. Copper to Copper: AWS B CuP 4 copper phosphorous.

J. Unions and Flanges

1. Unless otherwise specified herein, unions for copper and brass piping two inches and smaller in diameter shall be 125 SWP, bronze body brass ground joint type. Those larger than two inches in diameter shall be 150 SWP flat faced cast brass flanges conforming to ANSI Standard B16.24.

2. Where brass flanges and ferrous flanges are to be joined, ferrous flanges shall be full faced.

3. Mating of ferrous and non ferrous flanges shall be separated with rubber gaskets (1/16 inch minimum thickness) and Teflon liners installed in the bolt holes. Bolt holes shall be drilled to receive the Teflon lines. Physical contact between the ferrous and non ferrous flanges including the bolts, nuts and washers will not be permitted.

4. Unions for ferrous piping shall be of the same material as the piping to which they connect.

5. On grooved piping systems, the couplings shall act as the union

6. Grooved flange adapter Victaulic Style 641 or approved equal by Grinnell or Anvil Gruvlok for direct connection to CL 150 flanged components.

2.2 VALVES AND SUNDRIES

A. General

1. Manufacturer: Subject to compliance with requirements, provide products from one of the manufacturers listed.

2. Valve Design: Rising stem or rising outside screw and yoke stems.

3. Nonrising stem valves may be used where headroom prevents full extension of rising stems.

4. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.

5. Sizes: Same size as upstream pipe, unless otherwise indicated.

6. Operators: Provide the following special operator features:
   a. Handwheels, fastened to valve stem, for valves other than quarter turn.
   b. Lever handles, on quarter turn valves 6 inch and smaller, except for plug valves. Provide plug valves with square heads; provide one wrench for every 10 plug valves.
   c. Chain-wheel operators, for valves 2-1/2 inch and larger, install 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5 ft.-0 in. above finished floor elevation.
   d. Gear drive operators, on quarter turn valves 8 inch and larger.
e. Power actuators, on grooved end valves 2 inch and larger with electrical, hydraulic, or pneumatic activation.

7. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

8. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

      1) Caution: Where soldered end connections are used, use solder having a melting point below 840 deg. F for gate, globe, and check valves; below 421 deg F for ball valves.

B. Valves in the interior domestic water piping systems (cold water, hot water) and gas system:

1. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
   a. Apollo.
   b. Nibco.
   c. Victaulic.
   d. Watts.
   e. Swagelok (for lab cylinder gas piping).

2. Ball Valves
   a. Ball Valves, 1 Inch and Smaller: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; two piece construction; with bronze body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass ball, replaceable “Teflon” or “TFE” seats and seals, blowout-proof stem, and vinyl covered steel handle. Provide solder ends for domestic hot and cold water service.
   b. Ball Valves, 1-1/4 Inch and Smaller: Rated for 200 psi cold water pressure, two-piece construction; with forged brass body, full port, chrome-plated brass ball and brass stem, PTFE seat ring and packing, lever handle, push-to-connect ends for domestic hot and cold water service. Victaulic PermaLynx 300 Series or approved equal.
   c. Ball Valves, 1-1/4 Inch to 2 Inch: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; 3 piece construction; with bronze body conforming to ASTM B 62, conventional port, chrome-plated brass ball, replaceable “Teflon” or “TFE” seats and seals, blowout-proof stem, and vinyl covered steel handle. Provide solder ends for domestic hot and cold water service.
   d. All ball valves for laboratory cylinder gas piping shall be Swagelok Series 40G, or approved equal.

3. Check Valves
   a. In-Line, Lift-Type Check Valves, 1-1/2 Inch and Smaller: Suitable for installation in horizontal or vertical lines with upward flow, bronze body, stainless steel stem...
and spring, TFE disc with stainless steel disc holder, push-to-connect ends.
Victaulic PermaLynx 510 Series or approved equal.
b. Swing Check Valves, 2 Inch and Smaller: MSS SP-80; Class 125, cast bronze body and cap conforming to ASTM B 62; with horizontal swing, Y pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150 valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.

4. Gas Valves Interior
   a. Ball Valves: Ball valves shall be the fire seal type, conforming to UL 842 and UL 125.
      1) Valves shall be rated for service at not less than 200 psi at 200 degrees F.
      2) Valve bodies in sizes 1 inch ips and smaller shall be screwed end type constructed of ductile iron, carbon steel, or cast steel.
      3) Valve bodies in sizes 1 1/4 inch psi and larger shall be flanged end type constructed of ductile iron, carbon steel, or cast steel unless otherwise specified.
      4) Valve bodies shall have socket weld ends or butt weld ends where indicated to be welded, and body shall be constructed of carbon steel or cast steel.
      5) Balls and stems shall be Type 316 corrosion resistant steel.
      6) Valves shall be suitable for flow from either direction and shall seal tightly in either direction.
      7) Valves shall have full pipe size flow areas where indicated.
      8) Valve seats and seals shall be tetrafluoroethylene; seats shall have secondary corrosion resistant steel seating surfaces to effect shutoff should resin be burned out.
   b. Gauge Cocks: Gauge cocks shall be T head or lever handle ground key type with washer and screw, constructed of polished ASTM B 62 bronze, 125 psi. End connections shall suit the service, with or without union and nipple.
   c. Eccentric Plug Valves: Eccentric plug valve maximum size shall be limited to 3 inch psi.
      1) Eccentric plug valves shall be constructed with semi-steel body, bronze plug with Buna N resilient elastomer seals. Body sealing face shall be plastic coated.
      2) Body end connection shall be screwed for sizes 1 inch ips and smaller and flanged in sizes through 3 inch ips.
      3) Plug shall be top and bottom guided by oil impregnated bronze bushings and shall be corrosion resistant steel spring loaded.
      4) Valves shall be rated at 175 psi WOG and shall be UL listed for natural gas service.
      5) Valves shall be fitted with pinned lever operators.
      6) Valves shall be provided with locking device where indicated.
   d. Lubricated Plug Valves: Valves shall be Type 1, Style A or B, taper plug type, rated for not less than 175 psi WOG service and shall conform to MIL V 12003.
      1) Valves may be cylindrical plug type, constructed to service pressure and materials requirements specified for taper plug valves; in addition, clearance between plug and body sealing surfaces shall not exceed 2 mils for valves to
2 inch ips and shall be 3 to 5 mils for larger valves; plug stem seal and bottom support shall be reinforced tetrafluoroethylene; plug shall be bottom spring loaded.

2) Plug shall be full port or restricted port type, unless otherwise indicated.

3) Regulator bypass valves shall be provided with proportioning ports and locking feature.

4) Valves shall be provided with screwed end connections for all sizes 1 inch ips and smaller and flanged end connections for all larger valves.

5) Valves shall have an effective sealing and lubrication system which, when actuated, forces movement of plug within seating surfaces.

6) Check valve type lubrication fittings shall be provided for grease gun lubrication. Lubricant shall be identified and sufficient quantity shall be provided to lubricate each valve at least once.

7) Locking feature shall be provided, where indicated.

e. Solenoid Valves: Aluminum body, 120 volts AC, 60 HZ, Class B continuous duty modeled coil; NEMA 4 coil enclosure; electrically opened/electrically closed; dual coils; normally closed; UL and FM approved and labeled.

f. Gas Line Pressure Regulators: Single stage, steel jacketed, corrosion-resistant gas pressure regulators; with atmospheric vent, elevation compensator; with threaded ends for 2 inch and smaller, flanged ends for 2-1/2 inch and larger; for inlet and outlet gas pressures, specific gravity, and volume flow indicated.

g. Emergency gas shut off valve shall be Massachusetts State Plumbing Board approved. Install in Acorn Engineering Company, or approved equal, fully recessed cabinet 12 in. x 12 in. x 4 in., 16 gauge stainless steel body and without door. Provide sign with 1 in. Red letters above cabinet indicating “Master Gas Valve.” Cabinet shall have welded construction and #4 mil finish.

C. Sundries


2. Vacuum breakers shall be full size of line feed. All hose bibbs shall be supplied with vacuum breakers attached to hose thread portion of hose bibb unless they are integral to fixture.

3. Hose bibbs shall be equal to the following:
   a. (Mechanical Rooms) Chicago No. 998 (3/4 in.)

4. Shock absorbers shall be of the mechanical, pre-pressurized type installed where indicated and in accordance with "Standard P.D.I. WH201."

5. Combined Pressure Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 deg F, and pressure relief at 150 psi.

6. Pressure Regulating Valves: Single seated, direct operated type; having bronze body with integral strainer, and complying with requirements of ASSE Standard 1003. Select proper size for maximum flow rate and inlet and outlet pressures indicated.
2.3 FLOOR DRAINS

A. General

1. Floor drains shall be Jay R. Smith, Josam, Zurn, Orion, or approved equal. Manufacturer's catalog numbers specified herein for drains are intended only as a guide for the type and quality to be furnished under this Section of the Specifications.
   a. Lab waste floor drains shall be equal to Orion #AWFDSTD.
   b. Lab waste floor sinks at Autoclave shall be equal to Jay R. Smith Figure #3004-316SS-Y-12-F-C with square top, trap primer connection, 316 stainless steel construction, half grate and bottom dome strainer.

2.4 HANGERS AND ACCESSORIES

A. General

1. Provide pipe stands, supports, hangers and other supporting appliances as necessary to support work required by Contract Documents. All components of the hanger support system shall comply with the standards set forth in MSS-SP58 and MSS-SP69 (Manufacturers Standardization Society) latest publication.

2. Manufacturers: Subject to compliance with requirements, provide hangers and supports of Carpenter and Patterson, Inc, ITT Grinnel Corp., Elecen Metal Products or approved equal.

B. Secure vertical piping to building construction to prevent sagging or swinging.

C. Space hangers for horizontal piping as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Rod Diameter</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 and 3/4 in.</td>
<td>3/8 in.</td>
<td>6 ft.-0 in.</td>
</tr>
<tr>
<td>1 in. and 1-1/4 in.</td>
<td>3/8 in.</td>
<td>8 ft.-0 in.</td>
</tr>
<tr>
<td>1-1/2 and 2 in.</td>
<td>3/8 in.</td>
<td>10 ft.-0 in.</td>
</tr>
<tr>
<td>2-1/2 and 3 in.</td>
<td>2 in.</td>
<td>10 ft.-0 in.</td>
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</tbody>
</table>

D. Friction clamps shall be equal to Figures 126 and copper plated when in direct contact with copper or brass piping.

E. Hangers for uncovered ( uninsulated) copper or brass piping 2 in. and smaller shall be Carpenter & Patterson Figure 1ACT steel, copper plated band type.
F. Hangers for uncovered (uninsulated) steel or cast iron piping 2 in. and smaller shall be Carpenter & Patterson Figure 1A steel band type.

G. Hangers for uncovered (uninsulated) steel or cast iron piping 2-1/2 in. and larger shall be Carpenter & Patterson Figure 100 steel clevis type.

H. Hangers for all insulated piping shall be Carpenter & Patterson Figure 100 steel clevis type with insulation shield specified below.

I. Hangers for uncovered (uninsulated) copper or brass piping 2-1/2 in. and larger shall be factory applied copper plated steel clevis hangers, Carpenter & Patterson Fig. 100 CT. Rods and nuts used with these hangers shall also be factory applied copper plated.

J. Where three or more pipes are running parallel to each other, factory fabricated gang type hangers with pipe saddle clips, or rollers may be used in lieu of the hereinbefore specified Clevis hangers. These hangers shall be sized to provide for insulation protectors as hereinafter specified. Pipe saddle clips shall be not less than 16 gauge metal and shall be copper when installed with uninsulated copper piping. Where pipe rollers are provided for uninsulated copper or brass piping, insulation protectors shall be provided at each set of rollers and filled with a section of heavy density fiberglass pipe covering specified hereinafter. (Refer to insulation of this specification.) Fig. 342 sized to suit loading with hanger rods and nuts.

K. Extension type split ring hangers with wall plates shall be equal to Carpenter & Patterson Figures 81, 81 CT, 90 CT and 85, 85 CT plates for iron, steel and copper.

L. Hanger rods for other installations shall be sized in accordance with the recommended load capacities of ASTM Specifications Designation A 107, latest amendment.

M. Insulation protectors (shields) for horizontal piping shall be constructed of galvanized steel formed to a 180 degree arc and 12 inches long, equal to Carpenter & Patterson Figure 265P, 18 gauge type H for hangers 5 inches in size and smaller, 16 gauge for hangers larger than 5 inches in size.

N. Exposed rods, clamps and hangers shall be electrogalvanized coated.

O. Installation of hangers which permit wide lateral motions of any pipe will not be acceptable.

P. "C" clamps installed with pipe hangers or equipment hangers will not be permitted unless provided with retaining straps.

Q. All no-hub cast iron pipe 6 inches or larger in diameter shall be braced to prevent horizontal movement as required by code and recommended by the Cast Iron Soil Pipe Institute by using braces, blocking or rodding as illustrated in the CISPI Handbook, Vol. II, Specification Section 310-78.

R. All gas piping 2 in. and larger shall have seismic bracing. Refer to NFPA 13 for methods and procedures.
2.5 INSERTS AND ESCUTCHEONS

A. Inserts shall be individual or strip type of pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4 inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 2 inch diameter to be passed through the insert body. Strip inserts shall have attached rods with hooked ends to allow fastening to reinforcing rods.

B. Unless otherwise specified herein, escutcheons shall be cast brass chrome plated type and provided with a set screw to properly hold escutcheon in place.

2.6 PIPE COVERING (Filed Sub-Sub-Bid Required)

A. General

1. The pipe covering specified herein for piping system shall be provided to strict accordance with the manufacturer's printed instructions, the best practice of the trade and to the full intent of this Specification.
2. Flame/Smoke Ratings: Provide complete fibrous glass pipe insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
3. Manufacturer: Subject to compliance with requirements, provide products of Armstrong World Industries, Inc., Knauf Fiber-Glass, Owens Corning or approved equal.
4. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.
5. No leaks in vapor barrier or voids in insulation will be accepted.
6. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or smoke partitions shall have space allowed for application of approved packing between sleeves and pipe, to provide firestop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.

B. Interior Cold, Hot Water and above Ground Horizontal Storm Drainage Systems:

1. 1 in. thickness fiberglass piping insulation:
   a. ASTM E-547, Class I
2. Fire retardant foil face jackets for pipe insulation: ASTM C-921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at installation option.
3. Encase piping fittings insulation with one piece premolded PVC fitting covers, fastened as per manufacturer’s recommendations.
4. Encase exterior piping insulation with aluminum jacket with weatherproof construction.
5. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.
2.7 CLEANOUTS

A. Cleanouts shall be Jay R. Smith, Josam, Zurn or approved equal.

B. Bodies of cleanout ferules in hub and spigot or no hub piping shall be standard pipe size conforming in thickness to that required for pipe and fittings, and shall extend not less than 3/4 inch above the hub of the pipe. The cleanout plug shall be of cast brass and shall be provided with a raised nut 3/4 inch high. Cleanouts in copper waste piping shall be soldered brass cleanout fittings with extra heavy brass screw plugs of the same size as the pipe line. Cleanouts in threaded waste piping shall be cast iron drainage "T" pattern 90 degree branch fittings with extra heavy brass screw plugs of the same size as the pipe.

C. Floor cleanouts shall be as follows:
   1. General purpose flush finished floor cleanout with adjustable top shall be equal to Jay R. Smith Series 4026.
   2. Wall cleanout with cleanout tee and square frame and cover shall be equal to Jay R. Smith Series 4558.

D. Floor cleanouts for lab waste system shall be Orion FCO-RD with AWCO cast in cover.

2.8 PLUMBING FIXTURES

A. In general, the work of this Article shall include, but not be limited to:
   1. Plumbing fixtures and trim.
   2. Faucets.
   3. Stops and supplies.
   4. Traps and tailpieces.
   5. Drain outlets.
   7. Shower assemblies.

B. Fixtures and Trim

   1. Acceptable Manufacturers: Submit manufacturers not listed below for review and approval as specified for substitutions in Article Quality Assurance in this Section.
      a. Faucets: Chicago Faucet Co., Kohler or T & S Brass.
      b. Self Closing Faucets: Chicago Faucet Co., Kohler or Symmons.
      c. Stainless Steel Sinks: Elkay, Just Manufacturing or Metcraft Inc.
      f. Stops and Supplies: Chicago Faucet Co., Kohler or McGuire.
      g. P-Traps: McGuire, Sanitary-Dash, or Jameco.
2. P-1 Emergency Shower Station
   a. Guardian Model G1658, or approved equal, shower safety station unit for horizontal mounting.
   b. Shower furnished complete with 1” chrome plated brass stay-open ball valve and Teflon seals, stainless steel actuating arm, 29” stainless steel pull rod and 10” diameter orange ABS plastic shower head.
   c. Pipe and fittings shall be Schedule 40 galvanized steel for corrosion resistance.

3. P-2 Handwash Sink (Wall-Hung)
   a. Just Manufacturing Company Model #HCL-23520-S, or approved equal, wall-hung handicap lavatory fabricated of seamless welded construction, 18 gauge type 304 stainless steel with overall dimensions of 20” wide x 23-1/2” long and inside bowl dimensions of 14” wide x 16” long x 3” deep.
   b. Faucet to be Just Manufacturing #JSGN-6, or approved equal, deck-mounted, sensor operated type with laminar flow control, JTM-47 thermostatic mixing valve and J-ADA-115-FS flat grid lavatory drain with overflow.
   c. Two (2) Brasscraft, or equal, 3/8” angle supplies with L.K. stops and flex. risers.
   d. Just Manufacturing JT-125, or equal, 1-1/2” cast brass P-trap with bottom clean-out.
   e. Two (2) integral 18 gauge type 304 stainless steel wall brackets and one 14 gauge stainless steel wall clip.

4. P-3 Deck Mounted Eyewash
   a. Guardian Model G1899LH-L, or approved equal, eyewash station for deck mounted complete with 90 degree swivel for right hand mounting, two GS-Plus spray heads each with “flip top” dust cover, internal flow control, filter, 1/2” brass chrome plated stay open ball valve and ANSI compliant mounting sign.

5. P-4 Kitchen Sink (Single Bowl, Handicapped)
   a. Elkay #LWR-2522-R “Lustertone” 18 gauge, Type 304 stainless steel self rimming sink, 25” x 22” x 6-1/8” deep basin dimensions, depressed drain, back ledge drilled for 4” o.c. faucet holes, plastic sound deadening applied to underside.
   b. Faucet shall be Symmons Model S-26-IPS-W, single handle lever type with pull-out spray spout, retractable 5’ hose with spray to steam touch control, integral vacuum breaker and 6” lever handle, ADA compliant and satin nickel finish. Faucet shall be provided with 1.5 gpm flow restrictor.
   c. Kohler #K-13885, or equal, offset drain, Kohler #K-8998, or equal, adjustable 1-1/2” cast brass chrome plated P-trap with bottom clean out.
   d. Two (2) Brasscraft 3/8” angle supplies with L.K. stops and flex. risers.

6. P-5 Combination Emergency Eyewash/Shower Station
a. Guardian Model G1950BC, or approved equal, free-standing, pedestal mounted, combination eye/face wash and shower safety station unit complete with 11-1/2" stainless steel bowl, matching stainless steel cover and powder coated cast aluminum floor flange.

b. Shower furnished complete with 1" chrome plated brass stay-open ball valve and teflon seals, stainless steel actuating arm, 29" stainless steel pull rod and 10" diameter orange ABS plastic shower head.

c. Eye/face wash furnished complete with chrome plated brass stay-open ball valve, two FS-Plus spray heads and powder coated cast aluminum flag handle. Cover shall automatically raise when flag is activated.

d. Pipe and fittings shall be Schedule 40 galvanized steel furnished with orange polyethylene covers for vertical piping for high visibility and corrosion resistance.

e. Waste from shower head to spill to a floor drain.

f. Waste from eyewash station to be piped to the building’s acid waste system.

7. P-6 Radioactive Waste Sink (Countertop)

a. Elkay LR2522, or approved equal, 18-gauge, Type 304 stainless steel self-rimming sink, 3-cock hole with inside bowl dimensions of 25” wide x 22” long x 8” deep, plastic sound deadening applied to underside.

b. Faucet shall be Water Saver Model L2211TWI-VB-BH-3001, or approved equal, laboratory deck mounted mixing faucet with 6” rigid vacuum breaker gooseneck and wrist blade handles.

c. Two (2) Brasscraft, or equal, 3/8” angle supplies with L.K. stops and flex. risers.

d. Furnish and install sink strainer, trap and waste tail piece

8. Fixture Trim and Accessories: Provide fixtures complete with floor mounted fixture carrier supports; faucets, drain outlets, tailpieces, P-traps and stops and supplies.

9. Stops and Supplies: Provide stops and supplies of the same manufacturer as the fixture or faucet trim, or provide McGuire Model 170-LK loose key angle stop with 5 inch long 2 inch nominal copper sweat extension, bell escutcheon, and 3/8 inch O.D. by 12 inch flexible riser.

10. Sinks: Seamlessly drawn, self-rimming minimum 18 gauge, type 302 (18-8) nickel bearing stainless steel with 1-3/4 inch minimum rounded corners, satin finish, and fully undercoated.

11. Faucets: Chrome plated cast brass with stainless steel seats and monel stems. Gooseneck spouts shall be interchangeable and convertible rigid/swing type. Handles shall be interchangeable with square handle broachings.

12. Water Conservation: Provide water conserving fixtures and trim in compliance with the following maximum water use requirements. Provide Omni or equal variable pressure flow controls on sink faucets for 1.5 gpm flow.
13. Fixture Supports: Provide floor mounted fixture support carriers for wall mounted fixtures.

14. The following Laboratory Equipment is scheduled on the drawings and is to be furnished and installed under another section of the specifications, complete with all sinks, waste outlets and tailpieces. This subcontractor is to make final waste connections and provide traps, stops, supplies and all faucets, etc. as required. All faucets shall be equal to Chicago Faucet Co. deck or through back type with integral check stops, vacuum breaker type spout with serrated or slip type hose end. Each piece of equipment shall have individual stops on each supply.

a. **LE-1 Lab Bench Sink**

   1) Sink and lab bench to be furnished and installed complete by others. This subcontractor shall install the sink strainer, trap and waste tail piece.

   2) Lab bench sink water faucet shall be Water Saver Model L2211TWI-VB-BH-3001, or approved equal, laboratory deck mounted mixing faucet with 6” rigid vacuum breaker gooseneck and wrist blade handles.

   3) This subcontractor shall furnish and install all associated water piping between the mixing valve and faucet, as required.

b. **LE-2 Fume Hood**

   1) Fume hood and all accessories to be furnished and installed by others complete with all extended spindle controls, spouts, etc.

   2) This subcontractor shall make all final connections for each service noted, provide traps and stop each service and install a Zurn #Z-1022, or equal, trap primer at each trap.

c. **Cup Sinks**

   1) Cup sinks at lab benches to be furnished and installed complete by others. This subcontractor shall furnish and install trap and a Zurn #Z-1022, or equal, trap primer at each location.

d. **Laboratory Fixtures:**

   1) Double lab bench gas outlets shall be Chicago Faucet #987-909AGVCP, or approved equal, Y-Pattern with #907BC wall flanges, lever handle and chrome plated finish. Each handle shall be provided with a color coded insert. The insert shall be stamped with CW, GAS or CA white letters to identify the service provided.

   2) Single gas outlets shall be Chicago Faucet #937-CHAGV, or approved equal, with #907BC wall flange, cross handle and chrome plated finish. Each handle shall be provided with a color coded insert. The insert shall be stamped with CW, GAS or CA white letters to identify the service provided.
3) Process water faucets shall be Marquest Scientific Series LG, or approved equal, deck mounted gooseneck type of PVC construction and with union ball valve.

4) Lab cylinder gas shut-off valves shall be Swagelok Model SS-43GS6, or approved equal, 1-piece 40 Series ball valve of stainless steel construction and with Swagelok tube fitting connections. Shut-off valves shall be provided with engraved tags.

2.9 GAUGES AND THERMOMETERS

A. General

1. Gauges and thermometers shall be as manufactured by U.S. Gauge Ashcraft, Trerice or equal.
2. The accuracy of all gauges and thermometers shall be within one percent of the scale range.
3. Thermometers shall be located at all water heater outlets and on all hot water return after immersion aquastat. Provide copper separable socket and socket wells.

B. Pressure Gauges:

1. Gauges shall be installed with suitable "T" handle gauge cocks to permit servicing. Unless otherwise specified herein, all gauges shall be 5 inch diameter, dial type, stainless steel case aluminum peaker ring, phosphor bronze, bourdon tube, 1/4 inch forged brass N.P.T. male socket connection with wrench flats, white lithographed steel dial with black numbers and graduation. Dial graduations reading in "PSIG" shall be such that the normal operating pressure shall be indicated near the middle of the scale.

C. Thermometers:

1. Thermometers shall be red mercury type. Thermometers shall be graduated to "degrees F" and shall have a range so that the normal operating temperature will be in the middle of the scale.
2. The face of the thermometer shall be large enough so it may be read from the floor.

2.10 ACCESS PANELS

A. Furnish access doors and frames for walls and ceilings to applicable trades for installation. Size as required for access and maintenance, minimum 16 by 16 inches.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. J. L. Industries, Inc.
4. Milcor Inc.
5. Nystrom, Inc.

C. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
   1. Locations: Wall and ceiling surfaces as applicable.
   2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
   3. Frame: Minimum 0.060-inch-thick sheet metal with suitable bead flange.
   4. Hinges: Continuous piano.
   5. Lock: Cylinder, keyed alike.

   1. Locations: Wall and ceiling surfaces as applicable.
   2. Fire-Resistance Rating: Not less than that of adjacent construction.
   3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
   4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
   5. Frame: Minimum 0.060-inch thick sheet metal with suitable bead flange.
   6. Hinges: Continuous piano.
   8. Lock: Self-latching device with cylinder lock, keyed alike.

2.11 EQUIPMENT PROVIDED UNDER OTHER SECTIONS OR BY OWNER

A. Provide roughing and final connections for water, waste, vent and gas systems, including traps, tailpiece and strainers, wheel handle stops, valves, cocks and appurtenances furnished under other Sections or by User Agency as required. Provide valves and traps for fixtures and equipment, including work in, under and through tables, cabinets and equipment chases.

B. Equipment may vary from that indicated. Rearrangement of equipment from Drawings may be required. Make connections to rearranged equipment as part of work of this Section. Unpack, assemble and install supply trim for fixtures and equipment furnished under other Sections or by User Agency.

C. Provide miscellaneous equipment connections and indirect drains from fixtures and equipment. Provide unions at kitchen equipment and where necessary for disconnection of piping for maintenance.

D. Roughing shall not be undertaken until Designer has approved fixture and equipment shop drawings and template is furnished by pertinent manufacturer so that connecting requirements may be verified and work installed in neat and workmanlike manner. Exact location of service connections shall be obtained prior to roughing.

E. Provide shock absorbers with quick closing valves. Provide shut-off valves beneath absorbers. Absorbers shall be sized as required by Plumbing and Drainage Institute Standard PDI-WH 201.
F. Provide shutoff valves on fixture and equipment supplies.

G. Provide vacuum breakers in conjunction with water lines to booster and dishwasher and where required to prevent polluted back siphoning.

H. All connections and piping within the kitchen shall be made with chrome plated IPS brass with CPB fittings or stainless steel with all stainless fittings.

2.12 FIRESTOPPING

A. Work of Section 078413 - PENETRATION FIRESTOPPING.

2.13 SLEEVES AND PENETRATIONS

A. Piping penetrations through fire rated construction shall comply with a listed fire rated assembly as detailed in the UL Fire Resistance Directory. Pipe sleeves through floors, exterior walls and fire-rated construction shall be galvanized Schedule 40 steel pipe. Pipe sleeves through non-fire-rated partitions shall be 26 gauge-galvanized steel.

1. Sleeves Through Exterior Below Grade Foundation Walls and Floor Slabs on Grade: Provide galvanized Schedule 40 steel with continuous weld slop on welding flange water stop. Provide waterproof caulking assembly by Link-Seal or Sure-Seal.

2. In areas where pipe is exposed, install sleeves flush with the finish floor, except in mechanical rooms, and janitor's closets extend sleeves at least 4 inches above finish floor.

3. Annular Space Requirements: Sleeves shall be sized to provide a total clearance of approximately 1 inch around pipe including insulation cover. Annular space around fire rated through penetrations assemblies shall be in compliance with the Listed Assembly.

4. Packing between the pipe and sleeve in fire rated construction shall be a combination of listed insulation and fireproof caulk.

B. Where piping passes below grade beams and footings, provide a ductile iron sleeve three sizes larger than the pipe being served. Sleeve shall be a minimum of six feet in length.

2.14 VALVE TAGS

A. Upon completion of piping installation work provide valve tags on all valves installed under the work of the mechanical sections. Valve tags shall be at least 1-1/2 inch diameter brass or engraved plastic with 1/4 inch high lettering for service designation over 2 inch high consecutively numbered valve identification. Engraved valve tags shall be color coded as specified for piping identification. Coordinate valve tag numbers with the User Agency’s facility management program. Provide service designation prefix as scheduled:

1. Plumbing Systems: Prefix:
   a. Domestic Cold Water CW
   b. Domestic Hot Water HW
   c. Domestic Hot Water Circulation HWC
d. Fuel Gas  GAS
e. Normally Closed  NC
f. Unsafe Water  NP
g. Lab Cylinder Gas ‘A’  Gas ‘A’
h. Lab Cylinder Gas ‘B’  Gas ‘B’
i. Lab Cylinder Gas ‘C’  Gas ‘C’
j. Lab Cylinder Gas ‘D’  Gas ‘D’
k. Lab Cylinder Gas ‘E’  Gas ‘E’
l. Lab Cylinder Gas ‘F’  Gas ‘F’
m. Lab Cylinder Gas ‘G’  Gas ‘G’
n. Lab Cylinder Gas ‘H’  Gas ‘H’
o. Lab Cylinder Gas ‘I’  Gas ‘I’

B. Valve tags on plumbing systems may be engraved brass with black letters.

C. Identify Non-Potable water outlets with permanently attached yellow color-coded marker or 4-inch high triangle tag reading: Water Unsafe.

2.15 PIPING IDENTIFICATION

A. Piping: Provide clip-on color-coded piping identification markers on mechanical piping systems specified in Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING. Provide matching flow arrows to indicate direction of flow. Markers shall be equal to Seton Setmark. Pipe marking for outside diameters of 6 inches or greater may be springs or metal bands secured to the corners at each end of the semi-rigid plastic marker to hold each end of the marker firmly against the pipe.

1. Color coding and size of legend letters shall comply with the standards of ANSI A13.1.
2. Provide markers with legend letters sized in compliance with the following schedule:

<table>
<thead>
<tr>
<th>Outside Diameter (Over Insulation)</th>
<th>Size of Letters:</th>
<th>Length of Color Code:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/4 inch and smaller 2 inch</td>
<td>2 inch</td>
<td>8 inches</td>
</tr>
<tr>
<td>1-1/2 inch to 2 inch 3/4 inch</td>
<td>3/4 inch</td>
<td>8 inches</td>
</tr>
<tr>
<td>2-1/2 inches to 6 inches 1-1/4 inch</td>
<td>1-1/4 inch</td>
<td>12 inches</td>
</tr>
</tbody>
</table>

3. Plumbing Systems: Provide color-coded identification markers in compliance with the following schedule with contrasting legend letters.

<table>
<thead>
<tr>
<th>Service</th>
<th>Identification</th>
<th>Color Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold Water</td>
<td>Dom. Cold Water</td>
<td>Green</td>
</tr>
<tr>
<td>Hot Water</td>
<td>Dom. Hot Water</td>
<td>Green</td>
</tr>
<tr>
<td>Hot Water Return</td>
<td>Dom. Hot Water Return</td>
<td>Green</td>
</tr>
<tr>
<td>Soil or Waste</td>
<td>Sanitary</td>
<td>Yellow</td>
</tr>
<tr>
<td>Vent</td>
<td>Plumbing Vent</td>
<td>Yellow</td>
</tr>
</tbody>
</table>
2.16 IDENTIFICATION OF EQUIPMENT

A. Equipment: Stencil equipment such as pumps, water heaters, and tanks with the name of the equipment and equipment number. Coordinate equipment numbers with the User Agency’s maintenance personnel. Stencils shall be at least 6 inches high and of a color to provide a contrast with the equipment finish.

B. Equipment markings shall be prominently displayed on each normally visible side of equipment. Equipment intended for installation in finished area shall have markings located behind normally used access panels mounted so as to be readily found. Equipment identification designations shall be taken from equipment schedules as indicated on the Drawings.

PART 3 - EXECUTION

3.1 IDENTIFICATION

A. All equipment and each length of pipe fitting, trap, fixture, control panel, starter and device used in the systems shall have a permanently attached nameplate or be cast, stamped or indelibly marked with the manufacturer's mark or name, the weight, type and class. The nameplates shall be kept clean and readable at all times.

B. Painting

1. Finished field painting of designated plumbing works shall be performed under Section 099000 - PAINTING AND COATING.
2. All unpainted, non insulated, non galvanized, ferrous metal surfaces only of conduits, pipes, equipment, hangers, supports, accessories, and so forth, furnished and installed by this Subcontractor, shall be painted as follows by this Subcontractor. Concealed and Exposed one prime coat of metal primer. Underground two coats of black asphaltum paint.
3. Surfaces which will be inaccessible for painting after installation shall be painted before installation.
4. Surfaces to be painted shall be thoroughly cleaned of all scale, rust, dirt, oil and other foreign matter and shall be completely dry before applying paint.
5. After installation, equipment and accessories with factory primed or finished surfaces shall be cleaned, and bare or marred spots refinished and/or touched up by each Subcontractor with the same type paint and process as applied at the factory.
6. Nameplates on all equipment shall be cleaned and left free of paint.
7. Materials and workmanship shall be equal to the requirements specified under Section 099000 - PAINTING AND COATING.
3.2 DISINFECTION, CLEANING AND ADJUSTING

A. Disinfection

1. Each potable water system (cold and hot water) shall be cleaned and disinfected by this Contractor. Cleaning and disinfection shall be performed after all pipes, valves, fixtures and other components of the systems are installed, tested and ready for operation.

2. All hot and cold water piping shall be thoroughly flushed with clean potable water, prior to disinfection, to remove dirt and other contaminants. Screens of faucets shall be removed before flushing and reinstalled after completion of disinfection.

3. Disinfection shall be done using sodium hypochlorite in the following manner:
   a. A service cock shall be provided and located at the water service entrance. The disinfecting agent shall be injected into and through the system from this cock only.
   b. The disinfecting agent shall be injected by a proportioning pump or device through the service cock slowly and continuously at an even rate. During disinfection, flow of disinfecting agent into main water supply is not permitted.
   c. All sectional valves shall be opened during disinfection. All outlets shall be fully opened at least twice during injection and the residual checked with orthotolidin solution.
   d. When the chlorine residual concentration, calculated on the volume of water the piping will contain indicated not less than 50 ppm (parts per million) at all outlets, then all valves shall be closed and secured.
   e. The residual chlorine shall be retained in the piping systems for a period of not less than 24 hours.
   f. After the retention, the residual shall be not less than five parts per million. If less, then the process shall be repeated as described above.
   g. If satisfactory, then all fixtures shall be flushed with clean potable water until residual chlorine by orthotolidin tests shall be not greater than the incoming water supply. (This may be zero.)

4. All work and certification of performance shall be performed by approved applicators or qualified personnel with chemical and laboratory experience. Certification of performance shall indicate:
   a. Name and location of the job and date when disinfection was performed.
   b. Material used for disinfection.
   c. Retention period of disinfectant in piping system.
   d. ppm chlorine during retention.
   e. ppm chlorine after flushing.
   f. Statement that disinfection was performed as specified.
   g. Signature and address of company or person performing disinfection.

5. Upon completion of final flushing (after retention period) the plumbing subcontractor shall obtain a minimum of one water sample from each hot and cold water line and submit samples to a State approved laboratory. Samples shall be taken from faucets located at highest floor and furthest from meter or main water supply. The laboratory report shall show the following:
   a. Name and address of approved laboratory testing the samples.
   b. Name and location of job and date the samples were obtained.
c. The coliform organism count. (An acceptable test shall show the absence of coliform organisms.)

6. If analysis does not satisfy the above minimum requirements, the disinfection procedure shall be repeated.

7. Before acceptance of the systems, this Contractor shall submit to UMA’s Project Manager for his review, three (3) copies of Certification of Performance as specified above.

8. Under no circumstances shall this contractor permit the use of any portion of domestic water systems until properly disinfected, flushed and certified.

B. Cleaning and Adjusting

1. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by operation of the system for testing.

2. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishings due to the Plumbing sub contractor's failure to properly clean the piping system shall be repaired by this Contractor at no increase in Contract costs.

3. At the completion of the work, all water systems shall be adjusted for quiet operation.

4. All automatic control devices shall be adjusted for proper operation.

5. All plumbing fixtures and exposed metal work shall be cleaned and polished. Floor drain strainers and traps shall be cleaned of all debris.

6. All items of equipment shall be thoroughly inspected. Any items dented, scratched or otherwise damaged in any manner shall be replaced or repaired and painted to match the original finish. All items so repaired and refinished shall be brought to the attention of the Designer and UMA’s Project Manager for inspection and approval.

3.3 SYSTEMS

A. Sanitary Waste, Acid Waste, and Storm Drainage System

1. The Plumbing subcontractor shall be responsible for checking each pipe for alignment, center line elevation and invert grade for underground installations.

2. At times when work is not in progress, open ends of pipe and fittings shall be securely closed to the satisfaction of the Project Manager so that no trench water, earth or other substance will enter the pipe or fittings. Any section of a building drainage system that is found defective in material, alignment, grade or joints before acceptance shall be corrected to the satisfaction of UMA’s Project Manager. Pipe laid through rock excavation shall rest on a six inch layer of well compacted sand.

3. The sanitary (soil, waste and vent), storm and basement drainage piping three inches and smaller in diameter shall pitch a minimum of 1/4 inch per foot. Piping four inches and larger in diameter shall pitch a minimum of 1/8 inch per foot.

4. The soil, waste and vent stacks shall be connected as shown and extended through the roof a minimum of 18 inches. Soil, waste and vent pipes shall be concealed unless otherwise noted.

5. Branch connections to each drainage system shall be made with "Wye" and long turn "Tee Wye" fittings. Installation of short radius 1/4 bends, common off sets, double hub
fittings and saddles will not be approved. Installation of short "Tee Wye" fittings will be permitted for vertical piping only, and only where space conditions will not permit the use of long turn fittings. Only fittings conforming to the Code shall be installed.

6. The changes in direction of each drainage system shall be made with "Wye" branches and 1/8 bends. Provide long sweep bends at bottom of stacks with a vertical cleanout just above the floor at places where a "Wye" and 1/8 bends and end cleanouts cannot be installed.

7. Every fixture shall be separately trapped and the traps must be vented unless an approved battery vented system is being installed. Floor drains shall be considered as a fixture.

8. Vents shall be connected to the discharge of each trap in the sanitary system, thence carried individually to a point above the flood level of the fixture before connecting with any other vent pipes. Pitch the branch vents back to the fixture.

9. Collect individual vent pipes together in branch vent lines and connect to vent stacks. Wherever possible, vent stack offsets shall be made with 45 degree fittings. The vents passing through the roof shall be a minimum size of four inches in diameter.

10. Cleanouts shall be provided in drainage piping at changes in directions, at foot of stacks or other required points accessible for cleaning or rodding out.

11. Cleanouts shall be of the same size as the pipe installed in up to four inches in diameter and not less than four inches in diameter for piping larger than four inches in diameter.

12. The maximum horizontal distance between cleanouts in piping four inches in diameter and smaller shall not be more than 50 feet apart. In piping five inches in diameter and larger, cleanouts shall not be more than 100 feet apart.

13. Traps on sanitary piping not integral with fixtures and in accessible locations shall be provided with a brass trap screw protected by the water seal, and will be regarded as a cleanout.

14. Test tees with brass cleanout plugs shall be provided at the foot of all vertical soil, waste and storm drainage stacks and at each floor. Wherever cleanouts on vertical lines occur concealed behind finished walls, they shall be extended to back of finished wall, and a wall plate shall be provided.

B. Cold and Hot Water Piping (Including Non-Potable Cold Water)

1. Vacuum breakers shall be installed on supplies to each piece of equipment to prevent back siphonage.

2. Branch lines from water service or main lines shall be taken off the top or bottom of main, using such crossover fittings as may be required by structural or installation conditions. All water service pipes, fittings, and valves shall be kept a sufficient distance from other work to permit finished covering to be not less than 1.5 inches from other work and not less than 1.5 inches between coverings on the different services.

3. Provide shock absorbers at special equipment, tops of the risers, at each individual or each group of fixtures.

4. Water piping shall be run parallel and graded evenly to the drainage points. There shall be a 2 inch drain valve provided for each low point in the piping so that all parts of each water system can be drawn off.

5. Provide suitable means of thermal expansion for the hot water piping using swing joints, expansion loops and long turn offsets as required to suit building conditions.
6. Piping connections to equipment shall be provided with unions or flanges to permit convenient disassembly for alterations and repairs.

7. No piping shall be installed in a manner to permit back siphonage or any flow of water from sanitary or drainage systems into the water systems or their distribution piping under any conditions.

8. Air gaps, open end of funnel drains, and approved vacuum breaking devices shall be provided as specified or as indicated on the Drawings. Piping to hose end faucets or hose end fittings, or any fixtures where water supply outlet is below the fixture overflow rim shall have vacuum breakers.

9. Where flanges are installed in the water systems, red rubber gaskets shall be installed between each pair of flanges.

10. Heating or bending of copper tubing to eliminate the installation of fittings will not be permitted.

11. Piping systems shall be kept clean during all phases of work. Open ends of incomplete piping shall be protected to prevent the entrance of foreign materials.

12. Pipe shall be cut accurately to measurements established at the site and shall be worked into place without springing or forcing.

13. Connections to Existing Systems
   a. Isolate the existing section of piping by closing the closest upstream shut-off valve. Test the valve by reducing the downstream pressure to atmospheric pressure and closing all outlets. Monitor the system pressure for at least 2 hours to detect any increase in pressure by leakage through the valve.
      1) Before testing the zone valve verify that outlets are not leaking by pressurizing the section of piping between the zone valve box and the outlets and dosing the zone valve box. The system should maintain the same system pressure without a pressure drop for at least 5 minutes.
   b. While brazing the new connection, purge the piping with nitrogen back through the new connection from the closest gas outlet downstream of the new point of connection.
   c. Pressurize the system with nitrogen to 45 psig after brazing is completed. Blow the existing piping clear from the closest downstream gas outlet out the new connection into a clean white cloth until there are no signs of discoloration or particulates.
   d. Repressurize the system with the proper system gas and purge all outlets in the system starting with the outlet closest to the source of supply. Repeatedly purge the existing system through the existing outlets into a clean white cloth at normal system working pressure to verify that no particulates remain in the system.
   e. Do not make the new connection to the new roughed-in piping system until after the 200 psi particulate blow-down has been performed.
   f. All gas outlets in the effected Section of the existing piping system shall be tested and recertified with gas detectors to verify that proper system gas is present at the correct percentages before returning the system to the User Agency for patient use.
   g. Test the new connection joint with soapy water at normal system working pressure.

14. System Start-up and Adjustments
Morrill I and IV North
1st and 3rd Floor Microbiology Consolidation
Project #: 1007439
UMA#: 17-10

a. After completing installation work and equipment start-ups, perform the necessary adjustments to systems installed under this Section. Submit verification that systems are operating at the specified pressures.
b. Schedule factory trained engineering representatives to meet with the User Agency's Engineering and Maintenance staff and perform equipment start-up and maintenance seminar.
c. Adjust pressure regulating valves and verify that normally open or closed valves are set in accordance with the Contract Documents.
d. Perform the necessary adjustment work.

C. Installation of Natural Gas Piping

1. General: Install natural gas piping as shown on the drawings in accordance with the State of Massachusetts Uniform Plumbing/Gas Code as follows:
   a. Caulk spaces watertight between pipes and sleeves passing through exterior walls, slabs on grade and over crawl spaces, and waterproofed floors. Pack and seal spaces between pipes and sleeves passing through floors, walls, and ceilings of machine spaces, such as mechanical equipment, refrigeration, boiler, pump, fan, and machinery rooms at both ends of sleeve to provide an airtight acoustical barrier.
   b. Unless otherwise indicated, gas piping shall be run exposed. Where concealed piping is indicated, it shall be installed in a location to permit access to the piping with a minimum amount of damage to the building.
   c. The connection to the gas main in the street, piping and valves outside the building and meter installation shall be in accordance with local gas utility requirements.
   d. The gas supply pipe shall be of the size indicated on the drawings.
   e. A stop cock or tee handled gate valve, with cast iron extension box and cover, shall be installed in the gas supply pipe near the curb. A brass gas cock shall be installed in the gas supply pipe just inside the building wall. If the gas supply pipe is larger than 2 inch size, a bronze mounted iron body gate valve may be provided in lieu of the brass cock.
   f. Joints shall be made with graphite and oil or an approved graphite compound applied to the male thread only. After cutting, and before threading, pipe shall be reamed and all burrs shall be removed. Threads shall be accurately cut, and not more than three threads shall remain exposed outside each fitting after the joint has been made up. Each length of pipe shall be hammered and all scale shall be blown out before assembling. Threaded joints shall not be caulked to prevent or stop leaks.
   g. An approved type gas cock shall be installed in the branch connection to each riser and near each appliance. Plugged or capped outlets for future extensions or connections shall be provided where noted on drawings.
   h. Piping shall be graded not less than 1 inch in 40 feet of length to prevent trapping. The gas supply pipe from the main in the street to the meter shall grade up toward the meter. Horizontal lines from the meter to the risers shall grade down toward the risers and branches from risers to appliances shall grade up toward the risers and branches from risers to appliances shall grade up toward the appliances.
i. A full size tee fitting and a 6 inch long capped drip pocket shall be installed at the bottom of each riser or drop and at each low point in a horizontal gas line.

j. Uncovered, exposed pipes shall be provided with plates at the point where they pass through floors, finished walls, and finished ceilings. Where necessary to cover beads of fittings, special deep escutcheons shall be provided in lieu of plates. Plates shall be not less than 0.018 inch thick. Wall and ceiling plates shall be secured with round head set screws, not with spring clips. Unless otherwise specified, plates shall be of the one piece types. Wall and ceiling plates may be flat, hinged pattern.

k. Exterior gas piping shall have a cover of 30 inches and shall be a minimum of 3 feet from other structures such as other site piping.

l. Connections between metallic and plastic piping shall be made only underground, exterior and with an approved transition fitting.

m. Special care shall be taken and additional supported provided with installing the exposed exterior gas piping located at the emergency generator.

2. Installation of Valves
   a. Gas Valves: Provide and install gas valves at connection to gas train for each gas fired equipment item; and on risers and branches where indicated on the drawings. Locate gas valves where easily accessible and where they will be protected from possible injury.

b. Pressure Regulating Valves: Install pressure regulating valves in accordance with local utility company requirements and manufacturer's installation instructions. Install gas shutoff valve upstream of each pressure regulating valve.

3. Equipment Connections
   a. General: Connect gas piping to each gas fired equipment item, with drip leg and shutoff gas cock. Comply with equipment manufacturer's instructions.

4. Testing
   a. General: Inspect, test, and purge natural gas systems in accordance local code requirements and NFPA 54 requirements and as follows.
      1) Visually examine natural gas system after installation.
      2) Pressure test natural gas system with dry air or nitrogen at 100 psig for 2 hours. Soap test all joints to detect leaks.
      3) Flush and purge natural gas system and charge with gas in accordance with local utility requirements and NFPA 54.

D. Acid Waste Pipe and Fittings
   1. Fuseal II pipe and fittings shall be installed according to current Fuseal II installation instructions. (Refer to Chapter 4, Installation Instructions and Engineering Data, and include as part of specification.)

3.4 GENERAL INSTALLATION REQUIREMENTS

A. Piping Installation
   1. Install piping approximately as shown on the drawings and as directed during installation by the Designer’s representative.
2. Piping shall be installed as straight and direct as possible, forming right angles or parallel lines with building walls, other piping and be neatly spaced.
3. The horizontal runs of piping, except where concealed in partitions, shall be installed as high as possible.
4. Piping or other apparatus shall not be installed in such a manner as to interfere with the full swing of the doors and access to other equipment.
5. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the Drawings shall be followed as closely as possible.
6. It shall be possible to drain the water from all sections of each cold and hot water piping system. Pitch piping back to drain valves.
7. Screwed piping of brass or chrome plated brass shall be made up with special care to avoid marring or damaging pipe and fitting exterior and interior surfaces.
8. Small fittings shall be taper thread. Lampwick, cord, wool or any other similar material shall not be used to make up thread joints.
9. Screwed pipe and copper tubing shall be reamed smooth before installation.
10. All exposed piping in connection with fixtures shall be chrome plated. Where chrome plated piping is installed, cut and thread pipe so that no unplated pipe threads are visible when work is completed.
11. Reducing fittings, unless otherwise approved in special cases, shall be provided in making reduction in size of pipe. Bushings will not be allowed unless specifically approved.
12. Remove and replace with new materials, any copper or brass piping (chrome plated or unplated) showing visible tool marks.
13. Vertical risers shall be firmly supported by riser clamps, properly installed to relieve all weight from the fittings.
14. Any piece of pipe six inches or less in length shall be considered as a nipple.
15. All water service piping shall be kept a sufficient distance from other work to permit finished covering to be not less than 1.5 inches from other work and not less than 1.5 inches between the coverings (insulation) on the different services.
16. Grooved joint piping systems shall be installed in accordance with the manufacturer's (Victaulic or approved equal by Grinnell or Anvil Gruvlok ) guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic or approved equal by Grinnell or Anvil Gruvlok. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic or approved equal by Grinnell or Anvil Gruvlok factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
17. Push-To-Connect Joints: Install in accordance with the manufacturer's latest recommendations. Follow the latest published literature as provided by Victaulic or approved equal by Grinnell or Anvil Gruvlok. Pipe ends shall be cleaned, free from indentations, projections, burrs, and foreign matter. Use a tube preparation tool as supplied by Victaulic or approved equal by Grinnell or Anvil Gruvlok to clean. Apply
installation mark in accordance with Victaulic or approved equal by Grinnell or Anvil Gruvlok instructions. Push copper tube into fittings to installation depth mark, per Victaulic or approved equal by Grinnell or Anvil Gruvlok installation instructions. Keep fittings free of dirt and oil; use only on potable water or oil-free compressed air systems.

B. Hanger Installation

1. All piping shall be supported from the building structure by means of approved hangers and supports, to maintain proper grading and pitching of lines, to prevent vibration and to secure piping in place, and shall be so arranged as to provide for expansion and contraction.
   a. Maximum spacing of hangers on soil pipe shall be five feet and hangers shall be provided at all changes in direction. Vertical hanger rods to support piping from the structure or supplementary steel shall not exceed four feet in total length. Where pipe support assemblies exceed four feet in total length vertically, this Contractor shall provide factory fabricated channels and all associated accessories.
   b. Friction clamps shall be installed at the base of the plumbing risers and at each floor (above or below floor slabs). Friction clamps installed above floor slabs shall not be supported from or rest on floor sleeves.
   c. Provide hangers at a maximum distance of two feet from all changes in direction (horizontal and vertical) and on both sides of concentrated loads independent of the piping.
   d. Hangers, in general, for all horizontal piping shall be Clevis type hangers. These hangers shall be sized to fit the outside diameter of the pipe insulation and insulation protectors (sheet metal shields) specified herein. For sprinkler/stand pipe systems, hanger shall be approved black malleable iron, heavy duty pattern having two (2) parts bolted together.
   e. All vertical drops and runouts including insulated pipes shall be supported by split ring hangers with extension rods and wall plates. These hangers shall be copper plated when used on uncovered copper tubing. Supports on insulated vertical piping shall be sized to fit the outside diameter of the pipe insulation with 360 degrees insulation protector.
   f. Provide on each horizontal insulated lines, pipe covering protectors (shields) at each hanger. Each protector shall be sized to fit the outside diameter of the pipe insulation.
   g. Retaining straps shall be provided with all beam clamps.
   h. All supplementary steel, including factory fabricated channels, associated accessories, and 12 inch long sheet metal shields, throughout the project for this Section of the Specifications, both suspended and floor mounted, shall be provided by this Contractor and shall be subject to the approval of the Engineer.
   i. Hangers shall not pierce the insulation on any insulated pipe.
   j. Wire, tape or wood fastenings for shims or support of any pipe or tubing shall not be used.
   k. Remove all rust from the ferrous hanger equipment (hangers, rods, and bolts) and apply one coat of red lead immediately after erection.
   l. Piping at all equipment and each control valve shall be supported to prevent strains or distortions in the connected equipment and control valves. Piping at equipment
shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional support after these items are removed.

m. All piping shall be independently supported from the building structure and not from the piping, ductwork, conduit or ceiling suspension systems of other systems.

n. Installation of hangers which permit wide lateral motions of any pipe will not be acceptable.

o. "C" clamps installed with pipe hangers or equipment hangers will not be permitted unless provided with retaining straps.

p. All no hub cast iron pipe 6 inches or larger in diameter shall be braced to prevent horizontal movement as recommended by the Cast Iron Soil Pipe Institute by using braces, blocking or rodding as illustrated in the CISPI Handbook, Vol. II, Specification Section 310.

C. Pipe Covering Installation

1. Before pipe covering is applied, all pressure tests shall have been performed and approved by the Local Plumbing Inspector.

2. Pipe covering shall be applied over clean, dry surfaces.

3. Pipe covering shall be continuous and shall be carefully fitted with side and end joints butted firmly and tightly together and finished as specified herein.

4. Pipe covering and auxiliaries shall be kept dry during storage and application.

5. Adhesives, cements and coatings shall not be applied when the ambient temperature is below 40 degrees Fahrenheit.

6. Valve bodies shall have covering applied up to the stem.

7. It is the intent of this Specification that all vapor barriers be sealed and be continuous throughout. Staples shall not be used on vapor barrier jackets.

8. Where pipe covering ends occur at equipment or fixtures, end caps on the covering shall be provided.

9. Adequate operating clearances shall be provided at control mechanisms.

10. Pipe covering for flanges shall overlap the adjoining pipe by a minimum of three inches on each side.

11. Pipe covering shall be provided on all piping passing through ceilings and through the interior above ground sleeves (wall and floor).

12. All voids and seams in insulation shall be filled with insulating cement and finished as specified herein.

13. End joints of each section of the installed pipe covering shall be tightly butted.

D. Installation of Sleeves, Inserts and Escutcheons

1. Sleeves in floors shall be set 1 inch above the finished floor surface or as indicated on the Architectural Drawings.

2. Sleeves through interior masonry or non masonry walls or partitions shall be set flush with the finished surfaces of the wall or partition.

3. Field drilling for inserts required for work under this Section of the Specifications shall be provided by this Contractor.
4. Each interior wall or partition sleeve shall be packed with foam or glass wool to within one inch of each face of wall, and the remaining portion of each end of sleeve to be sealed with U.L. listed fire proof caulking compound equal to the rating of the partition.

5. Escutcheons shall be installed around all exposed insulated or bare pipe, except water closet starts or bends passing through a finished floor, wall or ceiling. Escutcheons shall fit snugly around the bare pipe or insulated pipe.

E. Valve Installation

1. Location of Valves: There shall be valves where indicated on the drawings and where specified as follows:
   a. At building service entrances, foot of all supply risers, branches to groups of fixtures, branches to separate fixtures, equipment, wall hydrants, hose bibbs, connections to other systems and sectionalizing points in each system.
   b. Each fixture supply shall have a separate angle stop or straight stop finished like the pipe it services.
   c. Each piece of equipment shall have isolation valves for each service connected.
   d. At the foot of each riser, on the inlet and outlet side of control valves.
   e. At the low points of each water system including trapped sections, provide a tee with 2 inch branch and valve with 3/4 inch hose end adapter and attached chain with cap.
   f. Valves shall be located to permit easy operation, replacement or repair.

F. Installation of Gauges and Thermometers

1. Thermometers and pressure gauges shall be installed in such a manner as to cause a minimum restriction to the flow in the pipes and so that they can be easily read from the floor.
   2. Thermometers shall be installed in the outlet piping from the hot water heater.
   3. Pressure gauges in the cold water system shall be installed at the water meter.

G. Installation of Pressure Reducing Valves

1. General: Install one or more pressure reducing valves on the main water line supplying plumbing fixtures.
   a. The total capacity of each assembly shall be not less than the capacity specified.
   b. Provide each pressure reducing valve with a gate valve and union on both the inlet and outlet connections.
   c. A bypass one pipe size smaller than the main water line provided with a globe valve and union, shall be installed between the inlet and outlet sides of the pressure reducing valve assembly.
   d. Pressure gauges shall be installed at the inlet and outlet connections to the pressure reducing valve assembly. Gauges shall have T handle stops in their connections.

H. Strainer Installation
1. General: Place strainers ahead of pressure reducing valves, automatic control valves, pumps, and elsewhere as indicated on the drawings or specified.

I. Installation of Cleanouts and Ferrules

1. Riser Connection to Sewer or Drain: Where soil, waste, or roof drainage risers connect to a sewer or drain extending from the building above the lowest floor, the fitting at the base of each stack or downspout shall be a sanitary tee or a combination Y and 1/8 bend with cleanout plug in the end of the run of the main.

2. Test Tees: Each vertical soil, waste, and vent pipe and each downspout and roof drainage pipe which connects to horizontal drain piping below ground shall be fitted with a test tee above the lowest floor or ground. Where accessible, test tee may be installed in the horizontal pipe at the base of the riser.

3. Cover Plates: Where cleanouts or test tees occur on concealed pipes in finished rooms, they shall be provided with a 1/8 inch thick, machine finished, brass cover plate of sufficient diameter to cover the opening in the finished wall or partition. The cleanout plug shall have a solid head, tapped for a 1/4 inch brass screw to secure the cover plate. Where cleanout plugs extend beyond the wall finish, the cover plates shall be of machine finished brass and shall be only of sufficient depth to fit against the wall to cover plug. Cleanout cover plates shall be painted to match adjacent wall finish.

4. Cleanout Plugs For Threaded Fittings: Cleanout plugs for threaded fittings shall be in accordance with ANSI B16.12. Except for test openings, where size must be sufficient to admit test plug, bushings will be permitted on pipes 5 inches and larger to reduce plug size to 4 inches; cleanout plugs for piping 4 inches and smaller shall be the same size as the pipe.

5. Cleanout Plugs For Hub and Spigot Fittings: Cleanout plugs for hub and spigot fittings shall be screwed into ferrules caulked into the fitting. Ferrules and plugs shall be in accordance with ANSI B16.12, except that plugs required to be flush with the floor shall have square countersunk heads in lieu of raised heads.

6. Cleanout Plugs For Copper Drainage Lines: Cleanout plugs on copper drainage lines shall be installed in solder joint fittings having threaded openings provided for the cleanout, or in solder joint fittings with threaded adapters.

J. Installation of Plumbing Fixtures

1. General:
   a. Refer to Architectural Drawings for locations and mounting heights of all plumbing fixtures, counter sinks, water fountains and showers.
   b. Provide with all plumbing fixtures, all trim, supports, fittings, connections and all incidentals necessary to make a complete installation in accordance with plumbing codes and the Contract Documents.
   c. All visible hanger nuts and all escutcheons shall likewise be chrome plated over nickel plate.

2. Examination:
   a. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.
b. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
c. Do not proceed until unsatisfactory conditions have been corrected.

3. Fixture Roughings
   a. Install rough plumbing including fixture carriers and supports, valves and water hammer arrestors within chase tolerances. Supply roughing through finish walls and at hose bibbs and shower heads shall be secure and free of movement. Locate valves and water hammer arrestors within 12 inches of approved access panel location.
b. Align exposed waste and supply pipe roughings with fixture connections within 1 inch tolerance. Provide flush valves in alignment with the fixture, without vertical or horizontal offsets. Obtain fixture manufacturer roughing data sheets for recommended roughing dimensions.
c. Secure fixture supports to floor slab construction with lag bolts and metal expansion shields to support at least 250 pounds on the front rim of the fixture for 5 minutes.
d. Provide fixture rough-in piping connections sizes in accordance with the following schedule:

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<th>HW</th>
<th>CW</th>
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<tr>
<td>Sinks</td>
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4. Fixture Supports
   a. All fixtures shall be supported and fastened to the building structure. The method of support for each type fixture shall be specified herein, except when the fixture designations on the Contract Drawings indicate modifications.
b. Installations shall be complete with all necessary bolts, nuts and washers, iron or brass connecting nipples between fixtures and piping system of the proper length and graphite non-asbestos gaskets for closet connections.
c. Where wall hung fixtures are secured to masonry walls or partitions, they shall be fastened with 1/4 inch through bolts provided with nuts and washers at back. Bolt heads and nuts shall be hexagon and exposed bolts, nuts, washers and screws shall be chromium plated brass.
d. Where secured to concrete or brick walls, they shall be fastened with brass bolts or machine screws in lead sleeve type expansion shields and shall extend at least three inches into solid concrete or brick work, except fixtures specified to be supported or chair carriers.

5. Installation of Fixtures
   a. Mount fixtures level at elevations shown on architectural drawings. Refer to toilet room elevations and casework details.
b. Install handicapped use fixtures in accordance with the requirements to the Architectural Access Board Code and ANSI A117.1. Insulate hot water supply and waste piping under lavatories.
   1) Where urinals are provided: Install one urinal with the rim mounted 15 inches above the finish floor in compliance with the handicapped code.
c. Grout wall and floor mounted fixtures watertight where the fixtures are in contact with walls and floors.
d. Caulk deck-mounted trim at the time of assembly, including fixture and casework mounted. Caulk self-rimming sinks installed in casework.

6. Fixture Trim:
   a. All materials specified to be chromium plated shall be thoroughly cleaned and polished before plating, and plate shall be heavily, thoroughly and evenly applied, guaranteed not to strip or peel.
   b. Where escutcheons are not furnished with plumbing fixtures, this Contractor shall supply them. Escutcheons shall be the type and material specified herein.
   c. Each fixture shall be separately trapped using the type and size of trap specified herein and required by the Plumbing Code.
   d. Unless otherwise specified, faucets and all exposed fittings shall be chromium plated. Chromium plating for brass shall be applied on a first plating of nickel.
   e. All fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of the fixture.
   f. All brass shall conform to brass tubing and shall be not less than No. 17 gauge.

7. Adjustments and Cleaning:
   a. After completion of the installation work and equipment start-ups, perform the necessary adjustments to systems installed under this Section. Submit verification that systems are operating at the specified temperatures and pressures.
   b. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
   c. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.
   d. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.
   e. Replace washers of leaking and dripping faucets and stops.
   f. Adjust flush valves, open fixture stops, and clean faucet aerators.
   g. Set aquastats on water heaters and circulation pumps.
   h. Adjust metering faucets to deliver a maximum of 1/4 gallon of hot water at a rate of 2 gpm and operate for at least 10 seconds upon activation.
   i. Temperature adjustments: Adjust pressure balanced mixing valves at showers to provide a maximum temperature of 112 degrees F. Adjust metering faucets in public toilet rooms to provide a maximum temperature of 110 degrees F.
   j. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.

8. Protection:
   a. Provide protective covering for installed fixtures and fittings.
   b. Do not allow use of fixtures for temporary facilities, except when approved in writing by UMA’s Project Manager.

3.5 INSPECTION AND TESTS

A. General
1. All labor, materials, instruments, devices and power required for testing shall be provided by the Plumbing Subcontractor. The tests shall be performed in the presence and to the satisfaction of the Designer and UMA’s Project Manager and such other parties as may have legal jurisdiction. No piping in any location shall be closed up, furred in, or covered before testing and approval by the Local Plumbing Inspector and UMA’s Project Manager.

2. Where portions of piping systems are to be covered or concealed before completion of the project, those portions shall be tested separately in the manner specified herein for the respective entire system.

3. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of UMA’s Project Manager shall be retested in part or in whole as directed.

4. The Authority retains the right to request a recheck or resetting of any pump or instrument by the Plumbing Subcontractor during the guarantee period at no additional cost to the Contract or UMA.

5. Repair, or if directed by Designer or UMA’s Project Manager, replace any defective work with new work without extra cost to UMA. Repeat tests as directed, until the work is proven to meet the requirements specified herein.

6. Restore to its finished condition any work, provided by other Contractors, damaged or disturbed by tests. The Plumbing Subcontractor shall engage the original Contractor to do the work of restoration to the damaged or disturbed work.

7. The fixtures shall be tested for stability of support and satisfactory operation. The piping shall be tested when directed by the Designer, Local Plumbing Inspector or UMA’s Project Manager for stability of support.

8. After the fixtures are set and connected, and the piping systems to same have been tested, the Plumbing Subcontractor shall turn water on to the fixtures, equipment, fill the traps, etc., and the proper operation of all items shall be demonstrated by him in the presence of and to the satisfaction of the Designer, UMA’s Project Manager, Plumbing Inspector, or their designated representative.

9. Caulking of screwed joints or holes in piping will not be acceptable.

10. The Plumbing Subcontractor shall notify the Designer, UMA’s Project Manager and all inspectors having jurisdiction, a minimum of 48 hours in advance of making any required tests so that arrangements may be made for their presence to witness scheduled tests.

B. Specific

1. Storm and Sanitary Piping Systems:
   a. Before the installation of fixtures, equipment and insulation, each system including vents shall have all necessary openings plugged to permit the entire system to be tested in accordance with the State Plumbing Code. Each system shall hold this water without a drop in water level. Test to be witnessed by Local Plumbing Inspector and UMA’s Project Manager.
   b. Where a portion of the system is to be tested, the test shall be accomplished with a vertical stack ten feet above the highest horizontal line to be tested may be installed, and filled with water to maintain sufficient pressure. A pump may be used to supply the required pressure. The pressure shall be maintained for a minimum of four hours for sufficient time to permit inspection of all joints.
2. Cold and Hot Water Piping System:
   a. Upon completion of the roughing in and before setting fixtures and final connections to all equipment, all water piping systems shall be tested to a hydrostatic pressure of 150 pounds per square inch.
   b. Each system's test shall be maintained for eight hours without a drop in pressure. These tests to be witnessed by Local Plumbing Inspector and UMA’s Project Manager.
   c. After testing, provide complete adjustment of all parts of each water system until design distribution or balancing is obtained throughout.

3.6 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. The Designer will check the completed installation either sequentially as different parts are completed, or when the entire installation is complete, at the sole option of the Designer.

3.7 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections or by User Agency.
5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Designer.
6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor mounted vibrating and rotating equipment provided under this Section.
7. Notify Designer of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Designer, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non-functioning and abandoned piping, ductwork and equipment as directed by Designer. Dispose of or store items as requested by Designer.

B. Installation Only Items

1. Where this contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for their unloading from delivery vehicles.
and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:

a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.

b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

2. This Contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this contractor will be considered only if presented in writing within one week of their date of delivery. Unless such claims have been submitted this contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.

C. Maintenance of equipment and systems: Maintain HVAC, Plumbing and Fire Protection equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.

D. Use of premises: Use of premises shall be restricted as directed by Designer and as required below.

1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Designer and as specified under CLEANING article.

2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.

3. Do not interfere with function of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Designer as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Designer to provide minimal interference with normal operation. Obtain Designer's approval of the method proposed for minimizing service interruption.

E. Surveys and measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.

2. In event of discrepancy between actual measurements and those indicated, notify Designer in writing and do not proceed with work until written instructions have been issued by Designer.
3.8 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear. Piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe openings shall be temporarily closed to prevent obstruction and damage before completion.

B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.

C. References to manufacturers and to catalog designation, are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.

D. Finish of materials, components and equipment shall be as approved by Designer and shall be resistant to corrosion and weather as necessary.

E. UMA will not be responsible for material and equipment before testing and acceptance.

3.9 CONTINUITY OF SERVICES

A. Do not interrupt existing services without UMA’s Project Manager's approval.

B. Schedule interruptions in advance, according to UMA’s Project Manager's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.

C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on User Agency's operations.

3.10 ANCHORS AND INSERTS

A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachment of equipment supports and hangars.

3.11 INSTALLATION OF EQUIPMENT

A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Designer and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.
B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Designer, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.12 PAINTING

A. Equipment shall have shop coat of non lead gray paint. Hangers and supports shall have one coat of non lead red primer. Machinery such as pumps, fans, etc., shall be stenciled with equipment name. Stencil shall be at least 6 in. high for large equipment, 2 in. high for small equipment. Finish painting, including painting of various piping and duct systems, shall be done under other Sections.

B. Note requirement for Designer's approval invoked under Part 3 article, MATERIALS AND WORKMANSHIP regarding finish of material and equipment which are visible or subject to corrosive or atmospheric conditions.

3.13 CLEANING

A. Piping
   1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
   2. Permanently install necessary chemical injection fittings complete with stop valves.
   3. After chilled water, heating hot water, condenser water, steam and condensate piping have been pressure tested and approved for tightness, clean and flush piping specified under WATER TREATMENT Paragraph.
   4. Maintain continuous blow down and make up, as required during flushing operation.

B. Equipment
1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.14 SYSTEM SHUTDOWNS

A. Coordination shutdowns of existing systems with the UMA’s Project Manager and submit a written request at least ten working days in advance. Minimize system shut downs as much as possible. Submit a list of all effected areas, the proposed work to be performed, and the expected length of the shut-down including time for retesting.

B. Provide temporary services to maintain active system during extended shut-downs as required for demolition and construction phasing.

C. Install new shut-off valves on existing cold water, hot water, hot water recirc, compressed air, RO water and LP gas pipe mains in First Floor Corridor and Third Floor Corridor.

3.15 CORE DRILLING

A. Do not core new concrete structure without written approval from the Structural Engineer.

B. Perform all core drilling required for the proper installation of this Section. Locate all required openings and prior to coring. Coordinate the opening with the other Trades and obtain approval from the Structural Engineer.

C. Thoroughly investigate the existing conditions in the vicinity of the required opening prior to cutting. Take care so as not to disturb the existing building systems. Damage to existing conditions incurred during core drilling shall be corrected to UMA’s Project Manager’s satisfaction with no additional expense to the UMA.

END OF SECTION
SECTION 230001

HEATING, VENTILATING AND AIR CONDITIONING

(Filed Sub-Bid Required)

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PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the University of Massachusetts at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

| NAME OF SUB-BIDDER: (Insert legal name of sub-bidder) |
| U.M.A Project: U.M.A 17-10 |
| U.M.A. PROJECT: Morrill I and IV North 1st and 3rd Floor Microbiology Consolidation |
| SUB-BID FOR SECTION: SUB-BID FOR SECTION: 230001 - HVAC |

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the Commonwealth of Massachusetts General Laws, as amended. Sub-bid forms may be obtained at the Procurement website: [http://www.umass.edu/procurement/constructionprojects.htm](http://www.umass.edu/procurement/constructionprojects.htm).

3. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the University of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements:

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-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub trade 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**

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D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

- M0.1 HVAC SCHEDULES & LEGEND
- M0.2 HVAC DETAILS
- M0.3 HVAC DETAILS
- M1.0 BASEMENT LEVEL HVAC PIPING PLAN - DEMOLITION
- M1.1 FIRST FLOOR HVAC DUCTWORK PLAN - DEMOLITION
- M1.2 FIRST FLOOR HVAC PIPING PLAN - DEMOLITION
- M1.3 THIRD FLOOR HVAC DUCTWORK PLAN - DEMOLITION
- M1.4 THIRD FLOOR HVAC PIPING PLAN - DEMOLITION
- M2.0 BASEMENT LEVEL HVAC PIPING PLAN - NEW WORK
- M2.1 FIRST FLOOR HVAC DUCTWORK PLAN - NEW WORK
- M2.2 FIRST FLOOR HVAC PIPING PLAN - NEW WORK
- M2.3 THIRD FLOOR HVAC DUCTWORK PLAN - NEW WORK
- M2.4 THIRD FLOOR HVAC PIPING PLAN - NEW WORK

1.2 DESCRIPTION OF WORK

A. Prior to Starting Any Work:

1. Submit shop drawings for review.

2. Submit an existing conditions air flow reading report prepared by an UMA approved air balancing contractor to cover the following:

   a. The report shall show SP across each component, full fan data and full motor data.
   b. Flow reading of:

      1) Existing fume hood exhaust fans located on Morrill IV North roof.
      2) Existing air handling unit S-1 located in the Morrill I mechanical penthouse.
      3) Existing central air handling unit located in the Morrill IV North Basement Level mechanical room.
      4) Traverse existing supply branch ductwork on Morrill I on all floors.
      5) Traverse existing supply branch ductwork on Morrill IV North on all floors
c. Clearly note any ductwork variation from the furnished existing conditions drawings.

3. Obtain from UMA any existing fume hood testing reports.

B. Work Included: Provide labor, material, and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Basis of Design:
   
a. Summer outside design condition- 88F DB/74F WB.
   b. Summer inside design conditions- 74F/50%RH for air conditioned spaces. Maximum 10F above ambient for ventilated spaces.
   c. Winter-0F outside, 70F inside.
   d. Ventilation-20 CFM/person for offices, 15 CFM/person for classrooms.
   e. Pressurization- Labs to be slightly negative to adjacent spaces. Building to be neutral or slightly positive to ambient.
   f. Filtration-2”-30% pre-filters + 12”-80% cartridge filters for equipments available with such options.
   g. VAV fumes hood exhaust system, with JCI/TSI system. Central duplex, high plume design fumes hood VAV exhaust fans.

2. Demolition and removal of:
   
a. Piping, equipment, and controls indicated to be removed or replaced.
   b. Pneumatic controls and all of its components properly capped and or bypassed.
   c. Removal of ductwork as indicated and as noted, including but not limited to ductwork, dampers, control dampers, diffusers, insulation, grilles and louvers.
   d. Removal of unused brackets, hangers, clips and all supporting appurtenance. Such removal shall include items rendered unused by the indicated removal, or any unused items found in the areas of scope.

3. Fume Hoods:
   
a. New low FV (60-80 fpm) fume hoods will be provided by others. The mechanical system is designed based on 100 fpm FV with 18” sash height to provide maximum flexibility for the University during the phased renovations of this building. Once fume hood has been selected with its VAV operating curve characteristics confirmed, revised balancing directive will be issued for the spaces having fume hoods. Contractor’s as-built drawings shall integrate this update.
   b. The new and salvaged hoods with VAV operation as detailed and to be controlled by DDC system as indicated.
   c. The system assembly shall comprise of factory made purposely built VAV fume hood control system, as manufactured by TSI Corporation or approved equal, fully compatible with selected DDC system and selected fume hood, to be field provided. The fume hood velocity sensor, transmitter receiver/controller I/O board, 316 SS control damper with modulating actuator, and a local continuous fume hood face velocity monitor/alarm/keyboard input, and electrical power as required. The continuous flow monitoring system shall comply with OSHA 29 CFR part 1910.
Low face velocity alarm shall be registered locally as well as at the remote facility monitoring station.

d. Exhaust air shall have flow monitor station to provide precise real time CFM reading to DDC for a proper tracking.

e. All components shall be designed to utilize low voltage shielded plenum rated wiring by ATC.

4. Existing Central Fume Hood Exhaust System:

a. Each fan sized for 17,000 CFM for a full redundancy, on a common plenum, with low leakage isolation dampers.

b. High plume height design.

c. Corrosion resistant.

d. Bypass damper to maintain high plume during low flow conditions, and to maintain SP set point below minimum VFD operation point of 25% RPM. Alternatively, the bypass damper may be used by UMA to increase dilution rate and plume height if the need arises. Bypass intake to have hood and bird screen, provided as part of the fan assembly by manufacturer. If the plenum is to be field furnished, it shall be constructed as per manufacturers specifications and a letter certification must be submitted to Designer upon field inspection by the manufacturer’s representative.

e. Fans are located on roof, and full sized risers run down through the building with taps provided on each floor.

f. Make complete air balancing of the system to meet the new duty, and to maintain minimum plume height of 30 feet above high roof level.

5. General Exhaust:

a. Will be made through VAV box with pressure independent DDC controls, will modulate its damper with feedback from supply and fume hood exhaust CFM readings to provide precise pressure independent flow controls and space pressurizations.

b. Each exhaust side VAV box will have analog output (AO) from DDC, damper position analog input (AI) to DDC and CFM reading AI to DDC.

c. Make complete air balancing of the system to meet the new duty, and to maintain minimum plume height of 30 feet above high roof level.

6. ATC:

a. A Johnson Controls Inc (JCI) Metasys DDC system and full interface to the campus wide JCI DDC system. The existing DDC system shall be expanded to serve the renovated spaces.

b. ATC shall provide occupancy sensors with auxiliary contacts. Each occupancy sensors shall be wired as separate digital input points to DDC.

c. Each fume hood will have one DDC control panel provided by ATC which will require 120 volt feed, which will be wired by ATC. Transformer and low voltage wiring from the junction box to controllers by ATC. All required 120V/1 Ph power and wiring for ATC work shall be by ATC. All power wiring required for ATC shall be responsibility of ATC sub subcontractor.

d. Assist commissioning agent as required.

e. High end graphics.

f. Refer to drawings and specifications for sequence of operations and controls logic.

g. DDC system shall be to the satisfaction of UMA Physical Plant, Mr. Jason Burbank
without any exception.

7. Tie-ins to existing hot water and chilled water piping.
8. Install new isolation valves on existing hot water and chilled water pipe mains in the First Floor and Third Floor Corridors of Morrill IV North and the Third Floor Corridor of Morrill I.
9. Demolition of existing roof exhaust fan RF-1 on Morrill I roof and installation of new roof curb cap.
10. Relocation and removal of existing systems which interfere with new construction.
11. Coordinate maintenance of existing services during construction with UMA’s Project Manager.
12. Special coordination of chases and plenums as specified in Part 3 article, Special Responsibilities.
13. Sleeves, inserts and hangers.
14. Flexible connections for pumps and other vibrating and rotating equipment.
15. Equipment bases and supports.
17. Motors.
18. Expansion joints.
19. Pressure gauges and thermometers.
20. Water treatment equipment, glycol, chemicals and testing.
21. Sheet metal work.
22. Complete air distribution system including low and medium pressure ductwork, diffusers, registers, grilles, splitters, dampers, and similar items.
23. Insulation for duct, piping, equipment and tanks.
24. Variable air volume terminal boxes.
25. New fan coil units.
26. Condensate drain piping from chilled water coil drain pans.
27. Pipe, duct, valve and equipment identification.
28. Instruction manuals and startup instructions.
29. All equipment requiring services; including but not limited to fire dampers, VAV terminal boxes, clean-outs and valves; to enclosed within walls, plaster ceiling space, under floor, and other inaccessible spaces shall be furnished with access panels, in accordance with section 230001,1.2, D, 2, 3 & 4. Exact locations shall be coordinated with Designer, and its location shall be marked clearly by this subcontractor.
30. The extent of the Heating, Ventilating and Air Conditioning (hereinafter, referred to as HVAC) Work is as shown on the Drawings and as specified herein.
31. Assist Commissioning Agent as required. In particular, a substantial involvement by ATC and TAB sub-subcontractors are foreseen.
32. Testing & Balancing (TAB):
   a. Selection of TAB filed sub-sub bidder shall be from the list of UMA prequalified contractors.
   b. Assist Commissioning Agent as required.
   c. Reading of all existing exhaust fan CFM and TSP prior to any work. Submit this initial existing conditions readings report to Designer before proceeding with further work.
   d. TAB of all new work and as indicated.
   e. TAB of fume hoods furnished by others.
33. Cleaning. This subcontractor shall maintain the area free of accumulation of debris by removing the debris from the area and site to the satisfaction of the Owner.
34. Automatic temperature controls, variable air volume controls and other controls.
35. Certified seismic restraints to meet the Commonwealth of Massachusetts Building Code applicable at the time the building permit is issued.
36. Core drilling for the Work of this Section.
37. Coordination drawings and record drawings and similar requirements.
38. Hoisting equipment for the Work of this Section.
39. Coordination with General Contractor for use of staging, planking and scaffolding, interior and exterior, which is the responsibility of the General Contractor as specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
40. Hydronic System Special Requirements:
   a. Upon completion of work but prior to handing over to the owner, clean all strain-ers by removing all baskets and flushing them out thoroughly.

B. Alternates: Not Applicable.

C. Items to Be Furnished Only: Furnish the following items for installation by the designated Sections:
1. Section 092116 - GYPSUM BOARD ASSEMBLIES:
   a. Access doors in gypsum board openings.
   b. Pipe and duct sleeves for placement into gypsum board openings.
2. Section 095113 - ACOUSTICAL PANEL CEILINGS:
   a. Access doors in acoustical tile.
3. Section 260001 - ELECTRICAL WORK:
   a. Magnetic starters.
   b. DDC control panels.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 078413 - FIRESTOPPING for coordination of floor and wall penetrations with firestopping contractor.
2. Section 092116 - GYPSUM BOARD ASSEMBLIES for coordination with gypsum ceilings and walls.
3. Section 095113 - ACOUSTICAL PANEL CEILINGS for coordination with acoustical ceilings.
4. Section 260001 - ELECTRICAL WORK for electrical power to mechanical equipment as indicated on the Drawings.

E. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

F. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in
accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

1.3 SUBMITTALS

A. Comply with requirements specified in Section 013300 - SUBMITTAL REQUIREMENTS.

B. Shop Drawing: Submittals shall include but not be limited to:

1. Ductwork Standards.
2. Piping Standards.
3. Fittings, valves and strainers.
4. Diffusers, registers, grilles, splitters, dampers, fire dampers and accessories.
5. Exhaust fans.
6. Filters.
7. Variable Air Volume boxes.
8. Fan Coil Units.
10. Combination fire/smoke dampers.
11. Automatic Temperature Controls (ATC).
12. Insulation and acoustical lining.
14. Pressure gauges and thermometers.
15. Motor starters.
17. Water treatment equipment.
18. Chemical resistant duct sealer.
19. Pipe, pipe hangers, sleeves and inserts.
20. Equipment bases and supports.
21. Identification for pipe, duct, valves and equipment.
22. Complete ductwork shop drawings, construction details and duct construction standards.
24. Color selection charts and samples for equipment and systems in finished areas.

C. Hanger Pull-Out Testing Submittals and Requirements: Hangers and supports will be tested for pull-out by the Independent Testing Agency designated by the UMA Project Manager. Comply with the requirements of Section 014325 - TESTING AGENCY SERVICES and the following:

1. Trade Contractor’s Documentation Prior to Testing:
   a. Submit manufacturer’s name and model number for each type of hanger and support proposed for use, and technical data including type, load capacity, test reports, methods for installation, and use limitations.
   b. Submit a schedule for each type of hanger and support indicating where units for testing will be installed, including substrate, and materials to be supported.
   c. Submit a letter from Trade Contractor indicating supports have been installed in accordance with manufacturer’s recommendations and project requirements, and are ready for testing.
2. Independent Testing Agency’s Documentation Prior to Testing for Trade Contractor’s Information:
   a. Submit the methods and type of equipment which will be used to test hangers and supports.
   b. Submit loads which will be applied, and criteria for acceptance or failure of hangers and supports.

3. Quantity to Be Installed by Trade Contractor for Testing: Two of each size of each type of hanger or support.

4. Testing Results: The Independent Testing Agency will submit reports indicating test results.
   a. Units which did not deform or fail during testing may remain in place.
   b. Units which failed during testing shall be replaced and testing repeated until satisfactory results are obtained.
   c. Cost of repeat testing will be at the expense of the Trade Contractor.
   d. Contractor shall repair damaged substrates, if any.

1.4 DEFINITIONS

   A. As used in this Section, "provide" means "furnish and install" and "HVAC" means "Heating, Ventilating and Air Conditioning" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

1.5 CONTRACT DOCUMENTS

   A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, HVAC, Electrical, Structural, and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.

   B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the Drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

   C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

   D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the Drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.
E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.

F. Data that may be furnished electronically by the Designer (diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Designer’s sealed or stamped construction documents.

1.6 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer’s interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.

B. Where Drawings or Specifications do not coincide with manufacturers’ recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.

C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.

D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with Paragraph (A) above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

E. In cases covered by Paragraph (D) above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.7 MODIFICATIONS IN LAYOUT

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.

B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.

C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.
D. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C and D above. Systems shall be run in a rectilinear fashion.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.8 EXISTING CONDITIONS AND PREPARATORY WORK

A. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts. Report conditions that might affect work adversely in writing through Contractor to Designer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.9 CODES, STANDARDS, AUTHORITIES AND PERMITS

A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
2. American Gas Association (AGA).
5. Occupational Safety and Health Act (OSHA).
6. Underwriters' Laboratories (UL).

B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.

C. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:

2. American Society of Mechanical Engineers (ASME).
5. American Water Works Association (AWWA).
6. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
7. Air Moving and Conditioning Association (AMCA).
8. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
9. American Diffuser Council (ADC).
10. Air Conditioning and Refrigeration Institute (ARI).
11. Thermal Insulation Manufacturers Association (TIMA).
12. Institute of Electrical and Electronics Engineers (IEEE).
13. Insulated Cable Engineers Association (ICEA).

D. Special attention is directed to requirements of NFPA 45, Laboratories Using Chemicals.

1.10 GUARANTEE AND 24 HOUR SERVICE

A. Guarantee Work of this Section in writing for one year following the date of Substantial Completion. If the equipment is used for ventilation, temporary heat, etc. prior to Substantial Completion, the bid price shall include an extended period of warranty covering the one year of occupancy, starting from the initial date of Substantial Completion. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer’s satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in UMA’s name.

C. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.

D. Provide 24 hour service beginning on the date the project is first occupied for public use by the User Agency, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to UMA. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and UMA approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.

E. Submit copies of equipment and material warranties to Designer before final payment.

F. At end of guarantee period, transfer manufacturers’ equipment and material warranties still in force to UMA.

G. This Paragraph shall not be interpreted to limit UMA’s rights under applicable codes and laws and under this Contract.

H. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph.

I. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use, and shall not institute guarantee period.

J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately...
to The UMA Project Manager’s satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will suggest course of action.

1.11 RECORD DRAWINGS

A. Comply with requirements specified in Section 017700 - CONTRACT CLOSEOUT.

B. All "main air" pneumatic control piping routing locations must be shown on the record Drawings.

C. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.12 MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field assembled units, including as built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:

1. Directions for and sequence of operation of each item of HVAC system, e.g. air handling units and boilers. Sequence shall list valves, switches, and other devices used to start, stop and control system. Detail procedure to be followed in case of malfunctions. Include detailed approved flow diagrams of temperature control, heating, condensate, chilled water, condenser water, etc. as appropriate for systems provided. Include approved valve directory showing each valve number, location of each valve, and equipment or fixture controlled by valve.

2. Detailed maintenance and troubleshooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.

3. Lubrication instructions detailing type of lubricant, amount, and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.

B. Furnish three copies of manuals to Designer for approval and distribution. Deliver manuals no less than 30 days prior to acceptance of equipment to permit User Agency’s personnel to become familiar with equipment and operation prior to acceptance.

C. Provide framed and glazed charts as follows: mount as directed by Designer.

1. Flow diagrams from first part of manual as described above.
2. Valve directory.
3. Lubrication chart from third part of manual.
D. Operating instructions: Upon completion of installation or when UMA accepts portions of building and equipment for operational use, instruct User Agency’s operating personnel in any or all parts of various systems. Instructions shall be performed by factory trained personnel. UMA shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.

E. Each contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.

F. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

1.13 COORDINATION DRAWINGS

A. Refer to Section 013100 - PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements.

B. Coordination Drawings include but are not necessarily limited to:

1. Structure.
2. Partition/room layout.
3. Ceiling tile and grid.
4. Light fixtures.
5. Access panels.
6. Sheet metal, heating coils, boxes, grilles, diffusers, etc.
7. All heating piping and valves.
8. Smoke and fire dampers.
9. Soil, waste and vent piping.
10. Major water and gas piping.
11. Roof drain piping.
12. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
13. Above ceiling miscellaneous metal.
14. Sprinkler piping and heads.
15. Heat tracing of piping.

PART 2 - PRODUCTS

2.1 DUCTWORK AND AIR DISTRIBUTION EQUIPMENT (Filed Sub-Sub-Bid Required)

A. Reference Standards: Material, construction and installation shall meet requirements of most recent editions of the following standards and references, except for more stringent requirements specified or shown on Drawings:
Standard | As Applicable To:
--- | ---
SMACNA HVAC Duct Construction Standards | Sheet Metal Ductwork; Duct Liners; Adhesives;
SMACNA Rectangular Industrial Duct Construction Standards | Fume Hood Exhaust Ductwork
SMACNA Round Industrial Duct Construction Standards | Fume Hood Exhaust Ductwork
Metal and Flexible | Fasteners; Flexible Ductwork.
SMACNA HVAC Air Duct Leakage Test Manual | Duct Leakage Testing
ADC and TIMA Flexible Duct Performance Standards | Flexible Ductwork
NFPA 90A | Fire Dampers; Fire Resistance Standards for Ducts and Liners
NFPA 45 | Laboratories using chemicals
ADC Test Code 1062 R4 | Ratings of Diffusers, Registers Grilles
SMACNA Guidelines for Welding Sheet Metal | Welded Galvanized, Black Iron and Stainless Steel Ductwork

B. General

1. Material requirements:
   a. Outdoor supply, return and general exhaust (return air to heat recovery wheel) ductwork shall be double wall spiral seam (or rectangular, as indicated on plans) with Type 304 stainless steel outer skin with 2” fiberglass insulation between the two skins and having minimum R-value of 8.0.
   b. Outdoor fume hood exhaust ductwork shall be Type 316 stainless steel single wall spiral seam (or rectangular, as indicated on plans).
   c. Inner skin for supply, return and general exhaust (return air to heat recovery wheel) ductwork shall be galvanized steel.
   d. All fume hood exhaust ductwork shall be Type 316 stainless steel of configuration indicated.
   e. Indoor general exhaust (return air to heat recovery wheel) ductwork shall be galvanized and wrapped.
   f. All outdoor ductwork fittings shall be factory fabricated as a water and air tight outdoor ductwork system.
2. Provide supporting and hanging devices necessary to attach entire HVAC system including ductwork and equipment, and to prevent vibration.
3. Provide vertical and horizontal supports as required by codes to meet minimum applicable earthquake resistance standards.
4. Ductwork shall be free from vibration under all conditions of operation. Dimensions shown on Drawings for lined ductwork are net inside dimensions. Increase ductwork to accommodate lining requirements.
5. Pipe or conduit crossing duct:
   a. No pipe, conduit, hanger, Architectural element nor structural member shall pass through duct without Designer’s written approval.
   b. Where it is impossible to route pipe or conduit and when written approval has been obtained, increase duct size to maintain constant cross sectional area at point of interference. Provide streamlined enclosure for pipe or conduit, as illustrated in SMACNA.
6. When making offsets and transformations necessary to accommodate structural conditions, preserve full cross sectional area of ductwork shown on Drawings.
7. Ductwork shall have pressure velocity classifications as follow:

<table>
<thead>
<tr>
<th>DUCT CONSTRUCT-ION CLASS</th>
<th>STATIC PRESSURE RATING</th>
<th>PRESSURE</th>
<th>SMACNA SEAL CLASS</th>
<th>SMACNA LEAKAGE CLASS</th>
<th>VELOCITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>4&quot;</td>
<td>Pos.*</td>
<td>A</td>
<td>3</td>
<td>4000 fpm or less</td>
</tr>
<tr>
<td>3&quot;</td>
<td>3&quot;</td>
<td>Pos. or Neg.</td>
<td>A</td>
<td>3</td>
<td>4000 fpm or less</td>
</tr>
<tr>
<td>2&quot;</td>
<td>2&quot;</td>
<td>Pos. or Neg.</td>
<td>A</td>
<td>6</td>
<td>2500 fpm or less</td>
</tr>
<tr>
<td>1&quot;</td>
<td>1&quot;</td>
<td>Pos. or Neg.</td>
<td>A</td>
<td>6</td>
<td>2500 fpm or less</td>
</tr>
<tr>
<td>½&quot;</td>
<td>½&quot;</td>
<td>Pos. or Neg.</td>
<td>A</td>
<td>6</td>
<td>2000 fpm or less</td>
</tr>
</tbody>
</table>

*a* for negative pressures over 3" w.g., refer to SMACNA Round and Rectangular Industrial Duct Construction Standards for joint and intermediate reinforcement requirements.

a. Unless otherwise specified or shown on the drawings, the following pressure classifications shall be used for the types of ductwork listed below:
   1) 4" Class: All supply ductwork from discharge of air units to inlets of terminal volume boxes.
   2) 3" Class: All fume hood exhaust ductwork.
   3) 2" Class: All other ductwork.

8. Sealing Requirements for Class A, Leakage Class 3, Galvanized, Non-Welded Aluminum or Non-Welded Stainless Steel Ductwork:
Morrill I and IV North
1st and 3rd Floor Microbiology Consolidation
Project #: 1007439
UMA#: 17-10

HEATING, VENTILATING AND AIR CONDITIONING
April 2017
230001 - 18

a. Transverse Joints
   1) During assembly, seal all flanged transverse joints with sealing tape of quality equal to Harcast Inc. 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer’s published procedures. After sealant has cured, seal entire joint with Harcast Inc. RTA-50 adhesive on to Harcast Inc. DT tape or approved equal.
   2) Seal all non-flanged transverse joints with Harcast Inc. RTA-50 adhesive on to Harcast Inc. DT tape or approved equal.

b. Longitudinal Seams
   1) Seal all longitudinal seams during ductwork fabrication with Harcast Inc. Cold Seal 1001 or approved equal.

c. Joints and Ductwall Penetrations
   1) Seal all duct joints at takeoffs, access doors, damper bearing penetrations, flexible duct connections etc., with Harcast Inc. Versa Grip 102 or approved equal.
   2) Note, access doors and damper rod penetrations shall be equipped with proper hardware for sealing.

d. Fume hood exhaust duct joints and seams shall be sealed with Precision Adhesives Model EZ-6010A, or approved equal, chemical resistant duct sealer. Duct sealer shall be specifically listed for hazardous exhaust systems.

9. Sealing Requirements for Class B, Leakage Class 12, Galvanized, Non-Welded Aluminum or Non-Welded Stainless Steel, Ductwork.

a. Transverse Joints
   1) During assembly, seal all flanged transverse joints with sealing tape of quality equal to Harcast Inc. 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer’s published procedures.
   2) Seal all non-flanged transverse joints with Harcast Inc. Versa Grip 102 or approved equal.

b. Longitudinal Seams
   1) Seal all longitudinal seams during ductwork fabrication with Harcast Inc. Cold Seal 1001 or approved equal.

10. Support
    a. Space hangers as required by SMACNA (8 ft max) for horizontal duct on 8 ft. centers, unless concentrated loadings require closer spacing.
    b. Support vertical duct on each floor or slab it penetrates.
    c. Supports for ductwork and equipment shall be galvanized unless specified otherwise.

11. Connections
    a. Connect inlets and outlets of air handling units and fans to ductwork with flexible connections unless fan has vibration isolator mounts inside unit with flexible connections and no external vibration isolators. Exception: Do not use flex on life safety smoke exhaust fans.
    b. Indoors, flexible connections shall be neoprene coated fibrous glass fire retardant fabric, by Ventfabrics, or Durodyne. Outdoors, flexible connections shall be Dupont hypalon coated fibrous glass fire, weather, and UV resistant by Ventfabrics or Durodyne.
c. Secure flexible connections tightly to air handlers with metal bands. Bands shall be same material as duct construction.

d. Connections from trunk to branch ducts shall be as detailed on Drawings.

12. Construction
   a. No sharp metal edges shall extend into air streams.
   b. Install drive slips on air leaving side of duct with sheet metal screws on 6" centers.
   c. Spin in collars shall NOT be used for branch connections in 3" or higher pressure class ductwork.

13. Joints
   a. Longitudinal lock seams shall be double locked and flattened to make tight joints.
   b. Make transverse joints, field connections, collar attachments and flexible connections to ducts and equipment with sheet metal screws or bolts and nuts. Do not use rivets and staples.

14. Prefabricated Transverse Duct Joints
   a. Transverse joints in galvanized sheet metal ductwork may be made with galvanized gasketed frame and angle duct joint system by Ductmate, TDF, TDC or approved equal. Angles shall be at least 20 gauge. Prefabricated transverse duct joints shall not be used for duct 16 GA. and heavier, nor for duct 23 GA. or lighter.
   b. Secure angles to duct with screws (using clutched arbor) or spot welds spaced as recommended by manufacturer for duct pressure class.

15. Elbows and Bends
   a. Elbows and bends for rectangular ducts shall have centerline radius of 1 1/2 times duct width wherever possible. Elbows for grease exhaust and fume hood exhaust shall be full radius. Vanes or mitered duct are not allowed.
   b. Where centerline radius is less than 1 1/2 times duct width (on supply, return and exhaust ductwork), elbows shall be radius throat (square throat allowed when turning around column or other close objects) with radius heel. For elbows whose width is greater than 48 inches and/or where shown on plans, provide splitter vanes. Install vanes in accordance with SMACNA. Where multiple elbows are separated by less than ten duct diameters use splitter (full length) vanes.
   c. For round ductwork provide stamped elbows, with centerline radii equal to 1 1/2 times duct diameter, or 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 radii equal to 1 1/2 times duct diameter in plane of bend, or gored elbows with gores as specified for round ducts.

16. Access Panels/Doors
   a. Provide proper pressure and leakage rated, gasketed, duct mounted access panels/doors for the following items with minimum sizes, as indicated. Access doors shall be of double wall construction doors in insulated ducts shall be insulated. Gauges of door materials, no. of hinges, no. and type of door locks shall be as required by the SMACNA Duct Construction Standards. Hinged doors are not acceptable, screwed or bolted access panels are not acceptable. Doors shall be
chained to frame with a minimum length of 6" to prevent loss of door. For seal Class A, access doors shall be leakage rated, neoprene gasketed UL 94 HF1 listed, DUCTMATE "sandwich" or approved equal. Door metal shall be the same as the attached duct material. For grease and high temperature ducts, door assembly shall be rated for 2300°F. The minimum sizes are:

1) Fire dampers 12" x 12", or larger.
2) Combination Fire/Smoke dampers 12" x 12", or larger.
3) Automatic control dampers 6" x 6" minimum.
4) Manual volume dampers 2 sq. ft. and larger 6" x 6" minimum.
5) Inlet side to all coils 12" x 12", or larger.
6) Suction and discharge sides of inline fans 24" x 24" minimum.
7) At additional locations indicated on drawings, or specified elsewhere 12" x 12" minimum.

b. Generally access doors are not shown on the drawings, but shall be provided in accordance with the above.

17. Extractors shall have adjusting rod and locknut on outside of duct.

18. Connections to roof fans:
   a. Shall be at least 22 ga. galvanized steel soldered watertight.
   b. Solder side seams at least 12" up from bottom.
   c. Provide suitable dielectric gaskets to join dissimilar materials.

19. Plenums and connections to louvers:
   a. Shall be 18 ga. minimum cross broken and properly reinforced with galvanized angle irons to SMACNA requirements.
   b. Shall have bottom and corner seams soldered watertight at least 12" up from bottom.
   c. Shall have neoprene gaskets or other non corrosible material to make connections to louvers watertight.
   d. Shall pitch connection back towards the louver. Provide half coupling drain connection at bottom of plenum unless noted otherwise Pipe drain to nearest floor drain.
   e. Shall have unused portions of louvers blocked-off with sheet metal; sealed air and water tight; insulated with 2" thick 6 lb. density rigid or board insulation.

20. Duct Pressure Tests
   a. Pressure test ducts after takeoffs and wall penetrations are in place and before applying exterior insulation. Correct any leaks.
   b. Pressure and leak test 100% of medium and low pressure duct work at 150% of duct construction class pressure. Duct shall be constructed so there is no joint or structural failure at the test pressure.

21. Duct Leakage Tests
   a. Leak testing shall be per SMACNA HVAC Air Duct Leakage Test Manual. Provide orifice assembly including straightening vanes, orifice plate mounted in straight tube with properly located pressure taps, and U tube manometer or other device as specified by SMACNA. Orifice assembly shall be calibrated accurately and shall come with calibration curve. Leakage classes shall be as previously specified. Submit leak test report (per SMACNA format) for Designer review. Drawings of ductwork tested shall also be submitted with report, indicating presence of takeoffs, wall penetrations, joints, etc.
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b. Leak testing shall be witnessed and approved by State Sheetmetal Inspector Chuck Wolf.

22. Materials
   a. Sheet metal ducts shall be constructed of hot dipped galvanized sheet metal with G90 Commercial coating according to ASTM 527 unless specified otherwise.
   b. Stainless steel (SS) ductwork shall be 18 gauge for kitchen hoods; and as required by SMACNA for other ducts. Materials shall be 316/No. 4 finish for exposed duct, 304/No. 1 finish for concealed ducts. Joints and seams shall be welded as required by SMACNA Guidelines for Welding Sheetmetal.
   c. Aluminum ductwork shall be Alclad 3003 1414 or alloy 5052 H32, of thickness required by the SMACNA duct construction standards with Alloy 6061 bracing angles, and Pittsburgh lock longitudinal corner and double side seaming.
   d. Flexible Ductwork
      1) Flexible ductwork, connecting to uninsulated or unlined duct, shall be polyester core with corrosion resistant helical wire reinforcing. The polyester core shall be minimum two ply and shall have a minimum thickness of 0.0017". Flex duct shall be U.L. rated for 6" W.C. positive pressure, 2" W.C. negative pressure with a maximum velocity of 4000 FPM. Flex duct must be listed as a Class 1 Connector according to UL 181 and shall meet the requirements of NFPA 90A maximum ASTM E 84 fire hazard rating shall be 25 flame spread, 50 fuel contributed and 50 smoke developed. Uninsulated flexible duct shall be equivalent to Wiremold, Type WB, or Flexmaster Types 2 and 4 (not type 9).
      2) Flexible duct connected to insulated or lined duct shall also be insulated and shall be equivalent to Wiremold Type WK or Flexmaster Types 2 or 4 (not type 9), with 1 1/2", 3/4 lb. density fiberglass insulation and an aluminized reinforced vapor barrier.
      3) Submittals shall include data on no. of polyester plies and minimum thickness of polyester core, in addition to other data listed above required to ensure that submitted product meets the requirements of these specifications.
      4) If flexduct other than the model numbers of the vendors listed above is submitted, a sample of the flex shall be submitted to the Designer. The Designer shall have sole discretion in determining whether the submitted flex is equivalent to that of the named vendors above.
      5) Unless otherwise indicated, flexible duct shall not exceed 5'-0" long.
   e. Rigid PVC ductwork shall be thermally formed ASTM D 1784 69 Class 12454 B with 3/16" thick wall.

C. 2" and Lower Pressure Class Ductwork, Rectangular:
   1. Ducts wider than 19" with more than 10 square feet of unbraced panel shall be beaded or cross broken.
   2. Internal stiffening struts shall only be used upon prior written approval of the Designer.
   3. Make changes in duct size with tapered connections as required by SMACNA. Changes shall NOT exceed 30°from line of air flow. Take off to the diffusers shall be 45° leading edge type or Bellmouth type.
4. Transverse joints shall be TDF/TDC or slip joints; use flat or standing seam according to SMACNA. Where duct size requires standing seam but space restrictions dictate flat seam, notify Designer prior to fabrication.

D. 2" and Lower Pressure Class Ductwork, Round:

1. Joints
   a. Longitudinal joints shall be spiral seam, butt welded, lap and seam welded, or ACME lock grooved seam. Snap lock seams shall be used on ½" w.g. pressure class duct only.
   b. Transverse joints shall be beaded sleeve joint or other approved joints listed in SMACNA. Use three or more sheet metal screws at 15" uniform intervals along circumference of joints.

2. Branch fittings shall be conical tee (Buckley or equal) or combination tee as shown in SMACNA.
   a. 3" and 4" Pressure Class Ductwork Rectangular

3. Joints
   a. Joints shall be prefabricated type by TDC, TDF or Ductmate. See Prefabricated Joints paragraph for specific requirements.

4. Duct reinforcement spacing and type shall comply with SMACNA.
5. Ductwork on both sides of transitions shall be run in same horizontal axis.
6. Diverging section slope shall be 1 ½" per foot or less if possible.
7. Contraction section slope shall not exceed 7" per foot.
8. Takeoffs shall be 45° leading edge type except that Bellmouths (Buckley or equal) may be used for takeoffs to terminal boxes if the distance between the box and point of takeoff is less than 8 ft.
9. Ducts with an aspect ratio greater than 3:1 shall be minimum of 18 gauge unless a thicker gauge is required by SMACNA.

E. 3" and 4" Pressure Class Ductwork, Round, Single Wall

1. Joints
   a. Longitudinal seams shall be lock spiral, lock longitudinal or butt welded longitudinal.
   b. Transverse joints shall be slip joints. Draw band joints shall be used on longitudinal seam duct only. Loose flange Vanstone joints may be used on ducts over 36" in diameter.
   c. Seams and joints in fittings shall be continuously welded. If coating is damaged during welding, repair joints to prevent corrosion.

2. Branch fittings shall be conical tee or combination tee as detailed in SMACNA.

F. Double Wall Ductwork

1. Duct and fitting shall be United Sheet Metal Co., Acousti K27, type P or Semco consisting of:
   a. External pressure tight shell of zinc coated steel.
b. Uniformly packed, 1" layer of fire resistant fibrous glass insulation with K factor of 0.27 with mylar or foil liner meeting 25/50 flame spread/smoke developed rating.

c. Internal perforated protective metal liner of zinc coated steel, with holes sized and spaced to give acoustic impedance of noise reduction characteristic of Acousti K27 duct.

2. Pressure shell of round duct shall be United or approved equal spiral pipe and pressure shell of fittings shall be zinc coated steel, as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Size</th>
<th>Gauge of Pressure Shell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duct</td>
<td>3&quot; to 6&quot;</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>7&quot; to 20&quot;</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>21&quot; to 34&quot;</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>36&quot; to 48&quot;</td>
<td>20</td>
</tr>
<tr>
<td>Fitting</td>
<td>3&quot; to 34&quot;</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>36&quot; to 48&quot;</td>
<td>18</td>
</tr>
</tbody>
</table>

3. Fittings shall be continuous, corrosion resistant welds made by certified welders.

4. Joints between straight duct sections shall be made with pre-fabricated couplings with 4" shoulder inserted into duct.

G. Flexible Rigid Duct

1. Flexible ductwork shall be Flexmaster Triple Lock Buck Duct Flexible Air Duct (insulated or non-insulated) as manufactured by Buckley Associates or equal (617 878 5000). Flexible duct, non-insulated, shall be Underwriters Laboratory Listed UL 181 Class 0 air duct and constructed in accordance with NFPA Standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.

2. Duct shall be made from a tape of dead soft aluminum sheet, spiral wound into a tube and spiral corrugated to provide strength and stability. The joint shall consist of a triple lock mechanically performed without the use of adhesives to make a durable airtight seam. A double lock is not acceptable.

3. Flexible duct connected to insulated or lined duct shall also be insulated. Flexmaster insulated flex shall have a gray Fire Retardant Polyethylene outer jacket with a ½ lb. density, 1 1/2" thick fiberglass insulation blanket, factory wrapped. Flexible Duct, insulated, shall be Underwriters Laboratory Listed and constructed in accordance with NFPA standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.

4. The flexible duct shall be supported as required.

5. Flexible duct work shall be rated at 12" positive pressure. Duct from 3 to 16" shall have a negative pressure of 12", 8" for duct work 18 and 20.

6. All flexible duct shall be individually cartoned and labeled for delivery to the job site for maximum protection.
H. Fire Dampers

1. Provide fire dampers throughout air distribution system as required by applicable codes, standards and authorities. Provide access door for each fire damper of sufficient size to repair internal link (see access panel/door section). Fire dampers indicated on drawings may not fully represent the exact number required for this project. It is the contractor’s responsibility, at no additional cost to the UMA, to provide all required dampers.

2. Dampers shall be approved fusible link self closing spring loaded type, Buckley Model 150B or approved equal by Nailor Industries, Prefco or Ruskin.

3. Frame shall be fitted with angle iron stop and stainless steel spring latch, and shall be securely fastened to building construction.

4. Seal spaces between damper frames and walls and between damper frames and floor with approved fire retardant material.

5. Use of dampers shall NOT reduce net free area of duct below that shown on Drawings. Fire dampers shall be Type B with blades of dampers out of air stream.

6. Samples of fire dampers shall be submitted to and approved by local authorities having jurisdiction.

7. Dampers shall bear 1 1/2 hour UL rating fire damper label and shall be constructed and installed as required by UL 555.

8. Dampers shall be installed per SMACNA with breakaway connections and nose pieces on duct liner (see SMACNA HVAC Duct Construction Standards).

I. Combination Fire Smoke Dampers

1. Combination fire smoke dampers shall be Ruskin Model FSDR25 (for round ducts) and Ruskin FSD37 (for rectangular ducts), or approved equal, by Buckley or Arrow with factory installed 24 VAC two-position, fail close electric actuators.

2. The combination fire smoke damper shall be specifically manufactured for vertical or horizontal position installation. Minimum 8" x 8" access door(s) shall be provided of size, location, and quantity as required to allow for adequate access for the fire smoke damper and actuator inspection.

3. Frame shall be manufactured of minimum 16 gauge galvanized steel. Blades shall be 14 gauge galvanized steel airfoil shaped single-piece construction. Bearings shall be stainless steel (galvanized bearings are not acceptable) permanently lubricated sleeve type turning in an extruded hole in the frame for maximum life. Blade edge seals shall be inflatable silicone mechanically locked into blade edge and shall withstand a minimum of 450 degrees F. Jamb seals shall be non-corrosive stainless steel metal compression type.

4. Each damper shall be provided with factory installed EFL/SP100 electric resettable “fuse” link and switch package.

5. Each damper shall meet the requirements of NFPA 80, 90A, 92A and 92B and shall have a fire rating of 1-1/2 hours in accordance with the latest edition of UL554. Dampers shall
be classified as Leakage Class I Smoke Dampers in accordance with the latest version of UL555S and bear UL label.

6. Dampers shall be AMCA licensed and shall bear the AMCA certified rating seal for air performance. AMCA certified testing shall verify pressure drop does not exceed 0.03” w.c. at a face velocity of 1000 fpm.

7. As part of the UL qualification, smoke dampers shall have demonstrated a capacity to operate (to open and close) under HVAC system operating conditions, with pressures up to 4” w.g. in the closed position, and 2000 fpm air velocity in the open position.

8. Combination fire smoke dampers and their actuators shall be qualified under UL555S to an elevated temperature of 250 degrees.

9. Dampers shall be installed in strict accordance with the State Building Codes, NFPA and the manufacturer’s installation instructions.

10. Damper actuators shall be powered open. Upon loss of power or signal from the common area smoke detectors via fire alarm system, combination fire smoke dampers shall close. Coordinate with Fire Alarm subcontractor and all trades.

J. Volume Dampers

1. Provide Young Regulator manual adjustable rectangular opposed blade dampers for duct heights less than 12" with factory installed locking hand quadrants extended 2" for all dampers installed in externally insulated duct:
   a. On each supply, return and general exhaust duct take off.
   b. At each take off to register, grille or diffuser (not all are shown on Drawing).

2. Dampers are manufactured approximately 5/16" smaller in width and 1/8" smaller in height than size of duct in which they are installed; e.g., nominal damper size is 24" x 10"; actual size is approximately 23 11/16" x 9 7/8".

3. Damper frame shall be constructed of #6063 extruded aluminum reinforced channel with minimum thickness of .050". Opposed damper blades shall be #6063 extruded aluminum with minimum thickness of .050" and shall include reinforcing ribs. Each blade shall be supported in the damper frame by individual Teflon axle bearings, and shall be driven by stainless steel connecting slide linkage controlled by 3/8" square steel control shaft.

4. Note: All required volume dampers may not be indicated on drawings but dampers shall be provided as necessary for systems balancing.

5. Dampers 12" and larger in height shall be opposed multi blade equal to Greenheck, Nailor, or Vent Products.

6. Where dampers are inaccessible, use Young Regulator locking type ceiling regulators and miter gear or worm gear for all horizontal dampers. Bearing coupling for bottom duct control may be used for shaft on vertical blade dampers. The 3/8" rod between ceiling regulator and damper shall be provided by contractor.

7. Damper blades shall be two gauges heavier than adjoining ductwork, and shall be riveted to supporting rods. Hem over edges parallel to rods.

8. Brackets shall be galvanized metal, secured to ductwork with sheet metal screw with locking quadrant arms (see seal class section for additional requirements). Provide 2" handle extension for all dampers on externally insulated ductwork.

9. Note: All required volume dampers may not be indicated on Drawings but dampers shall be provided as necessary for system balancing.
K. Automatic Dampers: Install automatic dampers furnished under Automatic Temperature Control Paragraph of this Section, as shown on Drawings, and as specified. Provide sealed wall penetrations for Seal Class A ductwork.

L. Branch Duct Take off Fittings

1. Contractor shall provide Buckley Bellmouth Take offs at all branch duct locations.
2. Bellmouth Fitting shall be Model BMD with damper. In areas where sufficient duct height is not available, the contractor shall provide the Buckley Mini mouth fitting, Model M BMD with damper or the flat oval Bellmouth, Model FOBMD with damper.
3. Bellmouths shall be constructed of heavy duty galvanized steel. Bellmouths shall include an air tight Neoprene gasket to ensure a tight fitting with minimal leakage. Pre-drilled holes shall be provided for quick mounting. Bellmouth shall be as manufactured by Buckley Associates or equal (617 878 5000).
4. Standard damper hardware to be constructed of 26 gauge galvanized material with a quadrant damper and tight fitting gasketing to ensure minimal leakage at damper pivot points.
5. Optional heavy duty hardware shall be provided at locations of higher static pressure where shown on the drawings.
6. Ninety degree take offs are not permitted on this project.

M. Registers Grilles and Diffusers:

1. List below is based on Metal-Aire models. Approved equal are Price, Titus and Krueger. Refer to architectural drawings and specifications for required compatibility with the ceiling or wall system which the RGDs are being installed.
2. Supply Registers (SR): Type VHD extruded aluminum double deflection adjustable vanes with opposed blade dampers. Anodized aluminum or white finish, color selection by Architect.
3. Linear Diffusers (LD): Series 6000 adjustable extruded aluminum two slot design with lined supply boot. Anodized aluminum or white finish, color selection by Architect.
4. Rectangular Ceiling Diffusers (CD): Series 5000 louvered face aluminum construction with lined plenum as detailed, opposed blade dampers, panel centered. Color to be white.
6. Return Registers (RR) and Exhaust Registers (ER): Type RHD with opposed blade dampers. Anodized aluminum or white finish, color selection by Architect.
7. Return Grilles (RG) and Exhaust Grilles (EG): Type RHD without damper. Anodized aluminum or white finish, color selection by Architect.
8. Transfer Grilles (TG): Type RH with sheet metal boot between the two TGs. Anodized aluminum or white finish, color selection by Architect.
9. Volume dampers associated with ceiling diffusers, linear slot diffusers, return registers and exhaust registers located above hard ceilings shall be provided with remote cable operated dampers, Young Regulator Company, or equal, with concealed ceiling cover plate.
2.2 ACOUSTICAL DUCT LINING

A. Provide 1" thick hospital grade, close cell foam liner by IMCOA EPFI or equal in accordance with article 2.02. No fiberglass is allowed.

B. Increase duct dimensions to accommodate lining while maintaining inside clear dimensions shown on the drawings.

C. Provide lining as indicated on Drawings.

D. Materials and installation shall meet following standards, as applicable:

1. NFPA 90A, UL723 (Class I), NFPA-255
2. SMACNA Duct Liner Applications Standard
3. SMACNA Mechanical Fasteners Standard
4. Adhesive and Sealant Council: Adhesives Standard for Duct Liner ASC A 7001A
5. ASTM E 84 fire hazard classifications of 25 flame spread, 50 smoke developed, and 50 fuel contributed.

E. Duct liner shall be installed without interruptions or gaps, using 100% coverage of adhesive and mechanical fasteners. Mechanical fasteners shall be welded or secured mechanically to duct on 12" maximum centers.

F. Cut liner to ensure overlapped and compressed longitudinal joints at corners. Transverse joints in liner shall abut precisely. Seal joints against fiber entrainment with approved adhesive, as recommended by manufacturer. Use sheet metal nosing at beginning of lining (in direction of flow) to minimize erosion.

G. The contractor shall ensure the integrity of acoustical lining when slip in duct heaters are installed; loose lining shall not flap about in the airstream. Secure edges of lining with sheet metal nosing, where liner is interrupted to make room for the slip in heaters.

H. Submit samples and catalog data for duct liner, mechanical fasteners, and adhesive to Designer for approval.

I. Mylar used for vapor barrier shall meet ASTM E-84 classification.

J. Lined ductwork does not need to be insulated.

2.3 DUCT INSULATION

A. General

1. Insulation shall be CertainTeed, Knauf, Manville or Owens Corning. Install insulation, mastics, adhesives, coatings, covers, weather protection and other work exactly as required by manufacturer's recommendations. Materials shall meet requirements of Adhesive and Sealant Council Standards and SMACNA.
2. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and other foreign matter prior to installation of insulation.
3. Leaks in vapor barrier or voids in insulation will not be accepted.
4. ASTM E 84 minimum fire hazard ratings shall be 25 flame spread, 50 fuel contributed and 50 smoke developed.
5. Where ducts are insulated, flexible connections to ducts shall be insulated.
6. Insulate standing seams with same material and thickness as duct.
7. Acoustically lined ductwork shall not be insulated externally, except as noted otherwise.
8. Insulation shall be continuous through wall and ceiling openings and in sleeves.
9. Transmission rates of vapor barriers shall not exceed 0.02 perms.

B. Concealed Ductwork

1. Insulate supply and fresh air ducts and plenum in concealed spaces and return duct not in ceiling plenum with 2" thick fibrous glass duct wrap, with foil kraft flame resistant vapor barrier.
2. Insulation density shall be 3/4 lb/cf with R-value of 6.4 and maximum K factor shall be 0.30 at 75°F mean temperature.
3. If insulation does not have pre-cut lap, make lapped butt joints by cutting 2" strip of insulation away from vapor barrier. Apply 6" strips of approved adhesive on 16" centers and wrap duct with insulation. Staple lapped joint with outward clinching staples. Seal stapled joints air tight with approved vapor barrier mastic or pressure sensitive tape.
4. For rectangular duct 24" or larger in any dimension, augment application method specified in item 3 with approved mechanical fasteners, such as weld pins with speed washers, on 18" centers on bottom of duct.
5. Cover breaks in vapor material with patches of same material, secured with adhesive and staples. Seal staples with approved vapor barrier coating.
6. Fill voids in insulation at jacket penetrations and seal with vapor barrier coating.
7. Seal and flash terminations and punctures with fibrous glass cloth between two coats of vapor barrier coating.
8. Terminate vapor barrier and extend insulation at standoff brackets.

C. Exposed Rectangular Ductwork

1. Insulate exposed supply, return and fresh air ducts and exposed plenum with 2" thick, semi rigid fibrous glass boards with factory applied fire retardant foil reinforced kraft vapor barrier facing.
2. Insulation density shall be 3 lb./cf with maximum K factor of 0.23 at 75°F mean temperature.
3. Impale insulation on mechanical fasteners applied to duct surface on 12" centers. Use at least two rows of fasteners on each side of duct. Provide fastener rows within 3" of seams and edges. Secure insulation with suitable speed washers or clips firmly embedded in insulation. Provide additional fasteners as necessary on cross broken ducts.
4. Extend insulation to standing seams, reinforcing, and other vertical projections 1" and less; do not carry over. Vapor barrier jacket shall be continuous across seams, reinforcing and projections. Insulation and jacket shall be carried over projections that exceed insulation thickness.
5. Transverse joints shall be butted tightly. Longitudinal joints shall be butted, ship lapped or 45° mitered. Seal joints with 4” wide strips of approved vapor barrier patch material and adhesive, or with approved pressure sensitive vapor barrier tape.

6. Cover breaks, ribs and standing seam penetrations with patch of jacket material no less than 2” beyond break; secure with adhesive and staple. Seal staples and joints with brush coat of vapor barrier coating.

7. Fill voids in insulation at jacket penetrations and seal with vapor barrier coating.

8. Seal and flash terminations and punctures with fibrous glass cloth between two coats of vapor barrier coating.

9. Terminate vapor barrier and extend insulation at standoff brackets.

2.4 PIPING AND FITTINGS (*Filed Sub-Bid Required*)

A. General:

1. Pipe materials and fitting materials shall be as indicated in Schedule of Pipe and Fitting Materials.

B. Schedule of Pipe and Pipe Fitting Materials:

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>SYSTEMS DESCRIPTION</th>
<th>PIPE SIZE</th>
<th>PIPE MATERIAL</th>
<th>JOINTS MATERIAL</th>
<th>FITTING MATERIAL</th>
<th>FITTING RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Water</td>
<td>HWS/R</td>
<td>2” and under</td>
<td>Copper, B88, Type K or</td>
<td>Soldered 95/5 Tin/Antimony or</td>
<td>Wrought copper, B16.22</td>
<td>Class 150</td>
</tr>
<tr>
<td>Chilled Water</td>
<td>CHWS/R</td>
<td>2-1/2” and over</td>
<td>Steel A53 Grade B, Smls or ERW Schedule 40 Standard</td>
<td>Butt Welded or Mechanically grooved piping system</td>
<td>Wrought Steel, A234 Grade WPB or Ductile iron grooved end fittings</td>
<td>Standard Weight</td>
</tr>
<tr>
<td>Condensate Drains</td>
<td>D</td>
<td>2” and under</td>
<td>Copper, B88, Type K</td>
<td>Soldered 95/5 Tin/Antimony or ProPress Fittings</td>
<td>Wrought copper, B16.22</td>
<td>Class 150</td>
</tr>
</tbody>
</table>
### SERVICE SYSTEMS DESCRIPTION

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>SYSTEMS DESCRIPTION</th>
<th>PIPE SIZE</th>
<th>PIPE MATERIAL</th>
<th>JOINTS</th>
<th>FITTING MATERIAL</th>
<th>FITTING RATING PSI/CLASS / WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vents</td>
<td>V</td>
<td>All</td>
<td>Galv. Stl., A53 or A120, Smls or ERW, Schedule 40</td>
<td>Threaded</td>
<td>Galv. Malleable Iron, B16.3</td>
<td>Class 150</td>
</tr>
<tr>
<td>MP Steam</td>
<td>MPS</td>
<td>2&quot; and under</td>
<td>Steel, A53, Grade B, Smls or ERW, Schedule 80</td>
<td>Threaded</td>
<td>Malleable Iron, B16.3</td>
<td>Class 300</td>
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<td></td>
<td>2-1/2&quot; and over</td>
<td>Steel, A53, Grade B, Smls or ERW, Schedule Standard</td>
<td>Butt Welded</td>
<td>Wrought Steel, A239 Grade WPB</td>
<td>Standard Weight</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2&quot; and under</td>
<td>Steel, A53, Grade B, Smls or ERW, Schedule 40</td>
<td>Threaded</td>
<td>Malleable Iron, B16.3</td>
<td>Class 150</td>
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<tr>
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<td>2-1/2&quot; and over</td>
<td>Steel, A53, Grade B, Smls or ERW, Schedule Standard</td>
<td>Butt Welded</td>
<td>Wrought Steel, A234 Grade WPB</td>
<td>Standard Weight</td>
</tr>
</tbody>
</table>

Note 1: Use copper for drain lines in plenums and through fire rated walls. Copper tubing must be insulated.

### Connections:

1. Provide dielectric fittings at connections of dissimilar materials.
2. Provide eccentric reducing couplings to bring pipes flush on top for water service and flush on bottom for steam service.
3. Branch lines in welded piping shall be made with welding tees except that branch lines less than one half diameter of main may be made with Weld O Lets or Sock-O-Lets.
4. Nipples shall be same material, make and thickness as pipe with which they are used. Close nipples shall not be used.
5. Make piping connections 2 1/2" diameter and larger to valves and equipment with welding neck flanges, ANSI B16.5, pressure rating to match system, flat or raised face as required.
6. Make piping connections 2" dia. and smaller to valves and equipment with steel body, 300 psi brass seat unions on steel piping and with heavy semi flushed brass unions on copper tubing.
7. Fit flanged joints with Johns Manville or approved equal full face gaskets. Flanges shall be faced and drilled to ASA standards and fitted with semi finished hexagon machine bolts and nuts of proper number and size.
8. Make screw joints tight with Teflon (polytetrafluoroethylene) tape or litharge glycerin mixture applied to male threads. Use tapered threads.
9. Make fusion welded joints as required by ANSI B31.1. Make changes in direction of pipe with welded fittings only. Bevel connections before welding, mechanically or by flame cutting.

D. Grooved Piping Systems
1. Paragraph titles, service designation references, listings, descriptions, instructions, etc. in following paragraphs shall be used as a guide in establishing materials and performance standards. This shall in no way limit provisions of Contract Documents, nor change, reduce or limit Contractor's responsibility to comply fully with provisions of Contract Documents.
2. Pipe, used with grooved fittings, shall be Schedule 40 steel, or as specified in the "Piping" paragraph.

E. Products
1. Grooved Piping
a. Grooved couplings may be used in lieu of welding, threaded or flanging on 2" and over carbon steel pipe, on water services from 30°F to 250°F within the manufacturer's rated working pressures. Pipe grooving shall be cut grooved and/or rolled grooved as per manufacturer's latest recommendations.
2. Piping Components
a. Grooved couplings shall consist of two pieces of ductile iron. Coupling gaskets will be a synthetic rubber gasket with a central cavity pressure responsive design. Coupling bolts and nuts shall be heat treated carbon steel, trackhead conforming to physical properties of ASTM A 183. All grooved couplings shall be manufactured by Victaulic Co. Style 177, 77, and W77 flexible type or 107H, 07, and W07 rigid type or approved equal by Grinnell or Anvil Gruvlok. Flexible couplings may be used with the Designer’s approval as outlined in the Pipe Hanging paragraph.

b. Victaulic or approved equal by Grinnell or Anvil Gruvlok flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the vibration source.
3. Branch Connections
a. For piping 2 1/2" and larger, full size branch connections shall be made with manufactured grooved end tees. Branch connections for less than full size shall be made with Victaulic hole cut or approved equal by Grinnell or Anvil Gruvlok. Branch connections with locating collar engaging into hole or outlet coupling used to join grooved pipe and to create a branch connection.
4. Gaskets
a. All gaskets shall be Victaulic Grade “EHP” or equal EPDM compound with working temperature of -30°F to 250°F (8” and smaller) and Grade "E" or equal EPDM compound with working temperature of 30°F to 230°F (10” and larger).
5. **Flanges**
   a. Flanges shall be Vic Flange Style 741 and W741 (2 24") or equal for connection to ANSI class 125 and 150 flanged components, or Vic Flange Style 743 or equal (2" 12") for connection to class 300 flanged components.

6. **Fittings**
   a. Fittings shall be full flow cast fittings, steel fittings or segmentally welded fittings with grooves or shoulders designed to accept grooved end couplings.
   b. Standard Fittings shall be cast of ductile iron conforming to ASTM A 536 (Grade 65 45 12), painted with a rust inhibiting modified vinyl alkyd enamel or hot dip galvanized to ASTM A 153 or zinc electroplated to ASTM B 633, as required.
   c. Standard Steel Elbow Fittings (14" 24") shall be forged steel conforming to ASTM A 106 Grade B (0.375" wall) or as-cast ductile iron, painted with rust inhibiting modified vinyl alkyd enamel or hot dip galvanized to ASTM A 153, with AGS grooved ends.
   d. Standard Segmentally Welded Fittings shall be factory fabricated, by fitting manufacturer, of carbon steel pipe as follows: 3/4" 4" conforming to ASTM A 53, Type F; 5" 6" Sch. 40 conforming to ASTM A 53, Type E or S, Grade B; 8" 12" Sch. 30 conforming to ASTM A 53, Type E or S, Grade B; 14" 24" O.375" wall conforming to ASTM A 53, Type E or S, Grade B, painted with rust inhibiting modified vinyl alkyd enamel or hot dip galvanized to ASTM A 153, as required.

7. **Valves, Strainers, Suction Diffusers**
   a. Vic 300 MasterSeal™ (2" - 12") grooved end butterfly valve or equal may be used for all services up to and including 300 PSI. Valve body shall be ductile iron with grooved ends designed to accept grooved mechanical couplings. Valves shall have an offset ductile iron disc core Disc seal (EPDM) shall be rated for service up to 250°F.
   b. Vic 300 AGS (14" – 24") grooved end butterfly valve or equal may be used for all services up to and including 300 PSI. Valve body shall be ductile iron with AGS wedge-shaped grooved ends designed to accept Victaulic “W” series couplings or approved equal. Valves shall have a PPS coated ductile iron disc core and seat shall be PPS coated surface. Rated for service up to 230°F.
   c. Ball Valves shall be Vic Ball style 726 or equal Ball Valves, designed for 800 PSI (WOG) bubble tight working pressure.
   d. Check Valves Single Disc (2" to 3"), non-slamming, spring-loaded check valves with a plated nickel seat, ductile iron body, stainless steel disc designed for 365 PSI. Installed in the vertical and horizontal positions. Victaulic Series 716H or approved equal.
   e. Check Valves Single Disc (4" to 12"), non-slamming, spring loaded check valves with a welded in nickel seat. Ductile iron body and disc designed for 300 PSI. Installed in the vertical and horizontal positions. Style 716, 779.
   f. Check Valves Dual Disc Design (14" to 24"), spring loaded check valves with EPDM seat bonded to the valve body. Ductile iron body and stainless steel disc designed for 230 PSI. Installed in the vertical and horizontal positions. Victaulic Series W715 or approved equal.
   g. Strainer shall be Victaulic Style 732 or approved equal and W732 Wye Pattern Strainer for easy access and cleaning with grooved ends for installation in vertical down flow or horizontal flow position.
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8. Expansion Fittings and Loops
a. All piping shall be installed as to avoid strain or distortion from expansion and contraction. Expansion and contraction in grooved piping systems shall be accommodated with loops or bends consisting of (8) Victaulic or approved equal flexible couplings, (4) 90 degree elbows, and (3) grooved end pipe spools, provided in water systems up to 250 deg F, in accordance with Victaulic or approved equal recommendations for expansion compensation.

b. Install in-line expansion joints in water piping systems that are installed in enclosures where pipe bends or loops cannot be applied.

1) 2” through 6” Sizes: Packless, gasketed, slip-type expansion joint with grooved end telescoping body for installation with Style 07 rigid couplings providing up to 3” axial end movement and working pressures up to 350 psi. Victaulic Style 150 Mover® or approved equal.

2) 3/4” and Larger Sizes: Combination of grooved end short nipples and Victaulic or approved equal flexible couplings joined in tandem to provide increased expansion. Joint movement and expansion capabilities determined by number of couplings/nipples used in the joint. Pressure rating dependent on size and style of flexible couplings used. Victaulic Style 155 or approved equal.

9. Hanging and Installation
a. All grooved components installed and requirements for hanging, supporting, anchoring, expansion and contraction shall be in accordance with the latest published manufacturer’s instructions.

b. Pressure and temperature ratings shall be as shown in manufacturer's latest published literature for individual style of coupling and gasket. Pressure and temperature ranges for valves shall conform to those in valves paragraph in Part Two of this specification.

c. Grooved Pipe Hanging:

1) Rigid piping systems, using Style 107H, 07 Zero Flex or W07 couplings or equal, shall be supported as shown on drawings, as called for in Part Two of these specifications and as called for by the ASME Building Services Piping Standard B 31.9.

2) Piping systems using Style 177,77, W77 other flexible Victaulic couplings or equal may be used if explicitly approved by Designer. The contractor shall submit a schematic piping diagram to the Designer. The diagram shall show all points of anchorage, where flexible type couplings are used and where rigid couplings are used. The diagram shall show expansion joints (if any).

d. Grooved Piping Installation:

1) Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer’s written instructions for pipe wall thickness. Use grooved-end fittings and rigid or
flexible, where required, grooved-end-pipe couplings. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. A Victaulic or approved equal factory trained field representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

F. Steam Service:

1. All steam supply valves, unless otherwise noted, shall be 150- psig ASME WP for low pressure (15 psig and lower) side, and 250 psig ASME WP for high pressure (greater than 15 psig, up to 125 psig).

2. Low Pressure Steam
   a. Gate- 2" and smaller shall be Milwaukee threaded ends 105 ASME 125 psig WP rising stem cast bronze body with bronze & SS trims; 2-1/2" and larger shall be flanged ends F- 2885-M ASME 125 psig WP OS & Y cast iron body with standard bronze trims.
   b. Globe- 2" and smaller shall be Milwaukee threaded ends 125 psig WP rising stem cast bronze body with standard bronze trims; 2-1/2" and larger shall be flanged ends Milwaukee 125 psig WP rising stem cast iron body with standard bronze trims.

3. Low Pressure Steam Condensate
   a. Gate - shall be same as the Low pressure steam gate valve specifications.
   b. Traps - Sarco FT or FTB as required, and as indicated.
   c. Traps for drips - Sarco inverted bucket trap, rated for minimum 30 psig WP.

4. High & Medium Pressure Steam:
   a. Gate- 2" and smaller shall be Milwaukee threaded ends ASME 250 psig WP rising stem cast bronze body with bronze & SS trims; 2-1/2" and larger shall be flanged ends ASME 300 psig WP OS & Y cast iron body with standard bronze trims.
   b. Globe- 2" and smaller shall be Milwaukee threaded ends 250 psig WP rising stem cast bronze body with standard bronze trims; 2-1/2" and larger shall be flanged ends Milwaukee 250 psig WP rising stem cast iron body with standard bronze trims.

5. High & Medium Pressure Steam Condensate:
   a. Gate - shall be same as the high pressure steam gate valve specifications.
   b. Traps - minimum 250 psig rated Sarco FT or FTB as required and as indicated.
c. Traps for drips - Sarco inverted bucket trap, rated for minimum 250 psig WP.

6. Provide threaded vacuum breakers with ball, spring, O-ring flexible seat, and screen. Ball shall be 440 stainless steel; seat shall be EPR. Spring shall be 316 stainless steel; screen and cap shall be 304 stainless steel and threaded collar shall be 416 stainless steel. Body shall be brass. Vacuum breakers shall be Johnson Series VB8 size 1-1/4 IPS, or equivalent by Watts or ITT Hoffman.

7. Provide unions for threaded end valves to facilitate removal from pipe.

8. All control valves shall be selected and furnished by ATC sub-subcontractor, to be installed by piping sub-subcontractor. Complete installation and proper operation shall be responsibility of this contractor. Selection of control valve may result in a single control valve shown on the contractor document in schematic form may actually end up being multiple tandem assembly, and such final design will be included in the bid price and coordinated.

2.5 VALVES AND STRAINERS

A. Valves on chilled water and hot water services shall be 125 psi unless noted otherwise. Pressure ratings of valves for steam and condensate services shall be as specified. Provide balancing valves where shown on Drawings.

B. Valves shall have name of manufacturer and guaranteed working pressure cast or stamped on bodies. Valves of similar type shall be by single manufacturer. Provide chain operators for valves 7 feet and higher above floor.

C. Provide butterfly valves for shutoff on chilled and hot water services 2 1/2" and larger. Do not use butterfly valves for balancing service.

1. Valves shall be rated 175 psi maximum working pressure, iron body, threaded lug with resilient EPDM seats, bronze disc and 416 stainless stem, by Centerline, DeZurik, Keystone, or Bray.
2. Valves 6" and larger shall have gear or chain operators.
3. Valves smaller than 6" shall have seven position lever or chain operators.
4. Test valves at 110% of rated pressure.

D. Provide bronze body ball valves with reinforced teflon seats, seals, bearings and packing. Ball valves shall be used for chilled, and hot water services in sizes 2" and smaller. Do not use ball valves for balancing service. Valves on insulated piping shall have 2" extended stems. Valves shall be by Apollo, Cannon, Nibco, Milwaukee, or Watts. Valves shall be rated 600 psi wog.

E. Provide globe valves for balancing and throttling steam and medium pressure condensate services by Crane, Jenkins, Milwaukee, Stockham or Walworth as follows:

1. Valves 2 1/2" and larger shall be iron body, flanged ends, bronze mounted, outside screw and yoke, renewable seat.
2. Valves 2" and smaller shall be bronze body, screwed ends, bronze trim.
3. Valves shall be ANSI B16.5 rated for (150) (300) pound service.

F. Check valves sized 2 1/2" and larger shall be iron body, flanged ends, bronze mounted, swing pattern. Check valves 2" and smaller shall be bronze, screwed ends, swing pattern. Check valves for hot water, chilled water and condenser water pump discharge shall be spring loaded, silent check, by APCO, Milwaukee, Mueller or Stockham.

G. Relief valves shall be brass with external lever, ASME approved. Pipe discharge to floor drain with open connection at floor. Pipe chiller refrigerant relief devices through roof to atmosphere.

H. Strainers
   1. Strainers 2" and smaller shall be 250 lb. bronze body, stainless steel, screen with 20 mesh screen opening, Y pattern, screwed ends, Sarco Type BT, Mueller, Watts or Armstrong.
   2. Strainers 2 1/2" and larger shall be 125 lb., cast iron body, stainless steel screen with manufacturer's recommended screen openings, Y pattern, flanged, Sarco Type AF 125 or equivalent by Mueller, Watts or Armstrong.
   3. Provide blow off valve on each strainer.
   4. Pump suction strainers 2" and smaller shall have 0.062 screen openings. Pump suction strainers 2 1/2" and larger shall have 0.125 screen openings.
   5. Strainer gaskets shall not contain asbestos.

I. Provide threaded vacuum breakers with ball, spring, O ring flexible seat, and screen. Ball shall be 440 stainless steel; seat shall be EPR. Spring shall be 316 stainless steel; screen and cap shall be 304 stainless steel and threaded collar shall be 416 stainless steel. Body shall be brass. Vacuum breakers shall be Johnson Series VB8 size 1 1/4 IPS, or equivalent by Watts or ITT Hoffman.

J. Provide unions for threaded end valves to facilitate removal from pipe.

K. Automatic Flow Control Valves
   1. Provide automatic pressure compensating flow control valves by Griswold, or Autoflow where indicated on the drawings. Valves shall have the capacities and pressure differential characteristics, as indicated, and conform to the following specifications. Valves 2" and smaller shall be threaded bronze valves 2-1/2" and larger shall be flanged iron or steel body.
   2. Valves shall be factory set and shall automatically limit the rate of flow to required engineered capacity within +5% accuracy over an operating pressure differential of at least 14 times the minimum required for control.
   3. The control mechanism of the valve shall consist of self contained, open chamber cartridge assembly with unobstructed flow passages that eliminate accumulation of particles and debris. All internal working parts shall be stainless steel or nickel plated brass. Body shall be ductile iron, cast iron or bronze.
   4. The cartridge assembly shall consist of a spring loaded cup. The cup shall utilize the full available differential pressure across the valve to actuate the cup and, thereby, reduce friction and hysteresis and eliminate binding.
5. Valves shall be available in minimum of three pressure differential ranges, with the minimum range requiring less than 2 psig to control flow. Valve bodies shall be provided with inlet and outlet tappings suitable for connection of instruments for verification of flow rates and temperature and shall be marked to show direction of flow. Valve bodies shall be rated for use at not less than 150% of system designed operating pressures.

6. Certified performance data for the flow control valve, based on independent laboratory tests, supervised and witnessed by a registered professional engineer, shall be available.

7. All flow control valves shall be supplied by a single source responsibility.

8. Each automatic flow control valve shall be furnished with a valve kit consisting of 1/4" x 2" minimum size nipples, quick disconnect valves (to be located outside of insulation), and fittings suitable for use with the measuring instruments specified, as well as temperature.

9. Provide a metal identification tag, with chain, for each installed valve. The tag to be marked with zone identification, valve model number and rated flow in GPM.

10. Flow control valve shall be warranted for period of five years from date of start up.

11. Provide UMA with dual hose meter kit including pressure gauge with 4 1/2" dial, 3 way push button operated valve, 5' long dual connection hoses, dual shutoff and vent valves, dual special valves for connection to standard valve kit, flow conversion chart and carrying case.

L. Combination Balancing/Flow Measurement/Shut-off Valves

1. Valves shall be Y-pattern style with multi-turn hand wheel.

2. Valves shall be capable of being installed in any direction without affecting flow measurement and shall provide the following functions:
   a. Precise flow measurement.
   b. Precision flow balancing.
   c. Positive shut-off with no drip seat.
   d. 3/4" drain port suitable for hose bib fitting. (Sizes 2" and below.)

3. Valves shall have four, 360° adjustment turns (2" and below), eight, 360° adjustment turns (2-1/2" - 6"), twelve, 360° adjustment turns (8", 10"), and sixteen, 360° adjustment turns (12") and up to twenty-two, 360° adjustment turns (16"). Handwheels shall have digital indicators with hidden memory and tamper-proof setting features.

4. Valves 2" and below shall be non-ferrous, pressure die-cast, non-porous Ametal copper alloy, with soldered ends. Install Series 78U union port fitting and Series 78 strainer/ball valve combination to complete terminal hookup at coil outlet.

5. Valves 2-1/2" and over shall be ductile iron body with all other metal parts of non-ferrous copper alloy. End connections shall be flanged or grooved.

6. Pressure ratings shall be 300 psi for 2" and below and 250 psi for flanged and 350 psi for grooved ends on 2-1/2" and larger.

7. Each valve shall have pressure/temperature readout ports with EPDM seals and attached shut-off valves.

8. One, computerized hand-held, balancing meter shall be furnished to the UMA Project Manager. The Testing and Balancing Contractor shall utilize this instrument for his work. The meter shall include the following:
   a. Flow measurement direct in GPM.
   b. Differential pressure measurement.
   c. Temperature measurement.
d. Automatic calibration.

e. Automatic air purging.

f. Extended data logging functions.

9. Balance valves 2" and under shall be Tour and Anderson Model STAS. Valves 2-1/2" and over shall be Tour and Anderson Models STAF-SG or STAG. The handheld meter shall be Tour and Anderson Model CBI with PCB data logging features. Balance valves manufactured by Armstrong or Victaulic or approved equal shall be considered equivalent.

2.6 PIPE INSULATION

A. Insulation shall be fibrous glass insulation with factory applied fire retardant vapor barrier jacket with K factor of 0.21 at 75°F mean temperature: by Owens Corning, CertainTeed, Manville or Knauf, installed as required by manufacturer. ASTM E 84 fire hazard ratings shall be 25 flame spread, 50 smoke developed and 50 fuel contributed.

B. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.

C. No leaks in vapor barrier or voids in insulation will be accepted.

D. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or smoke partitions shall have space allowed for application of approved packing between sleeves and piping, to provide fire stop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.

E. Insulate flexible connections to same thickness and with same material as adjoining pipe insulation.

F. Provide fibrous dual temperature insulation with factory applied vapor barrier jacket on steam, outdoor condenser water, outdoor cooling tower drain and makeup, condensate, chilled water, drain, hot and cold water piping, unless noted otherwise.

G. Drain piping other than PVC piping and outdoor cooling tower drain piping shall have ½" thick insulation. Insulation thickness for indoor steam, steam condensate, chilled water, hot water and cold water piping shall be as follows:

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<thead>
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<th>TABLE A</th>
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<tr>
<td>Insulation Thickness</td>
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<tr>
<th>PIPE INSULATION</th>
<th>FLUID TEMP.</th>
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<th>4&quot; TO 6&quot;</th>
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**Morrill I and IV North**

**1st and 3rd Floor Microbiology Consolidation**

**Project #: 1007439**

**UMA#: 17-10**

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<tr>
<th></th>
<th>Max</th>
<th>Min</th>
<th>Avg</th>
<th>Min</th>
<th>Temp</th>
<th>Density</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Med. press./temp.</td>
<td>251-350</td>
<td>4</td>
<td>4.5</td>
<td>4.5</td>
<td>0.29</td>
<td>200º</td>
<td></td>
</tr>
<tr>
<td>Low press./temp.</td>
<td>201-250</td>
<td>2.5</td>
<td>2.5</td>
<td>3</td>
<td>0.27</td>
<td>150º</td>
<td></td>
</tr>
<tr>
<td>Low temp.</td>
<td>141-200</td>
<td>1.5</td>
<td>2</td>
<td>2</td>
<td>0.25</td>
<td>125º</td>
<td></td>
</tr>
<tr>
<td>Low temp.</td>
<td>105-140</td>
<td>1</td>
<td>1.5</td>
<td>1.5</td>
<td>0.24</td>
<td>100º</td>
<td></td>
</tr>
<tr>
<td>Steam Condensate</td>
<td>Any</td>
<td>1.5</td>
<td>2</td>
<td>2</td>
<td>0.27</td>
<td>150º</td>
<td></td>
</tr>
</tbody>
</table>

---

**COOLING SYSTEMS**

**Chilled Water**

40-55 | 1 | 1 | 1 | 0.23 @ 75º

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H. Insulation on steam relief lines and general below ground (not buried) steam and condensate piping of pressures greater than 10 psig shall be 11 lb./cu. ft. density, molded hydrous calcium silicate fastened with 16 gauge annealed wire on 18" centers. Exposed covering shall be finished with 8 oz. canvas jacket.

I. Insulation for prefabricated piping specified in Pre-insulated Piping Paragraph shall be cellular glass of 1 1/2" thickness for chilled water and 2 1/2" for hot water, Foamglas by Pittsburgh Corning or approved equal, with maximum K factor of 0.35. Insulation shall meet applicable requirements of this Paragraph.

J. Provide longitudinal lap and 6" wide vapor barrier joint seal strips secured with approved adhesive.

K. Seal ends of pipe insulation and seal insulation to pipe with approved fire retardant vapor barrier, at flanges, valves and fittings and at intervals of no more than 21 feet on continuous runs of piping.

L. Secure covers on concealed pipe with metal bands at least 3/4" wide and no more than 18" apart, spaced to hold ends and centers of each section.

M. Insulation on outdoor piping shall be twice the thickness listed in Table A above, but not more than 4". Waterproof with 0.016" thick aluminum jacket with 2" transverse and longitudinal lapped seams oriented to shed water. Fill seams with weatherproof adhesive. Secure jacket with 1" wide aluminum draw bands on 12" centers.

N. Do not insulate indoor condenser water systems. Provide 2" insulation on outdoor condenser water piping, only if heat traced.

O. Insulation on Fittings, Valves and Flanges

1. Fittings, valves and flanges shall be insulated with pre cut, factory supplied fibrous glass, by CertainTeed, Knauf, Owens Corning or Manville.
2. Fittings, valves and flanges shall be insulated with same material and to same thickness as adjoining pipe insulation.
3. Pipe fittings shall be pre tested, clean and dry before insulation.
4. Installation of insulation on fittings shall be as follows, in order:
   a. Wrap insulation around fitting and tuck ends into fitting throat.

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**HEATING, VENTILATING AND AIR CONDITIONING**

**April 2017**

**230001 - 39**
b. Edges of adjacent insulation shall be tufted and tucked in, to fully insulate fitting to
   thickness of adjacent pipe insulation. Use two or more thicknesses if necessary.

c. If two layers of insulation are used on fittings, wrap and secure first layer with
twine before applying second layer.

d. Top layer of insulation shall be covered with one piece, PVC, Zeston molded
fitting cover. Secure cover with stainless steel tack fasteners inserted into jacket
throat overlap seam.

e. Tape joints with pressure sensitive vapor barrier tape; tape shall extend 2" on either
   side of joint.

5. Prior to taping of joints on chilled water lines, apply vapor barrier mastic (brushed on) to
   fitting cover, throat overlap and edges. Also apply vapor barrier mastic to pipe insulation
   jacket ends.

6. For strainers and other valves or fittings which need maintenance, provide preformed
   removable insulation section.

2.7 PIPE HANGERS AND SUPPORTS

A. Provide pipe stands, supports, hangers and other supporting devices in accordance with ANSI
   B31.9 and MSS-69, as necessary to support work required by Contract Documents.

B. Secure vertical piping to building construction to prevent sagging or swinging.

C. Space hangers for horizontal piping as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Rod Diameter</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1 1/4&quot;</td>
<td>3/8&quot;</td>
<td>8 ft. 0&quot;</td>
</tr>
<tr>
<td>1 1/2 and 2&quot;</td>
<td>3/8&quot;</td>
<td>10 ft. 0&quot;</td>
</tr>
<tr>
<td>2 1/2 and 3&quot;</td>
<td>½&quot;</td>
<td>10 ft. 0&quot;</td>
</tr>
<tr>
<td>4 and 5&quot;</td>
<td>5/8&quot;</td>
<td>12 ft. 0&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>3/4&quot;</td>
<td>12 ft. 0&quot;</td>
</tr>
<tr>
<td>8&quot; and over</td>
<td>7/8&quot;</td>
<td>12 ft. 0&quot;</td>
</tr>
</tbody>
</table>

D. Horizontal copper tubing shall have maximum hanger spacing of 5 ft. for tubing 1 1/4" dia. and
   smaller and 10' for tubing 1 1/2" and larger. Maximum spacing for PVC pipe hangers shall be
   4'.

E. Reduce spacing to a maximum of 10' - 0" apart, regardless of pipe size, as necessary for fittings,
   valves and other concentrated loads.

F. Support piping 4" dia. and larger from structure with pipe roll hangers with adjustable steel rod
   hangers, sized to accommodate insulation.

G. Support piping 3" dia. and under from structure with Carpenter and Patterson Fig. 100 clevis
   hangers or approved equal.

H. Hangers shall be by Carpenter and Patterson, F & S, or Grinnell Co. Figure numbers of
   Carpenter and Patterson are specified to establish standards of quality for performance and
   materials.
I. Provide spring hangers with travel stops as specified in Vibration Isolation Paragraph where necessary and where shown on Drawings.

J. Pipe supports for 4" and larger pipe and insulated high temperature piping shall have welded inserts of equal thickness to insulation to prevent compression of insulation. Other insulated pipe shall have 12", 14 GA shields at hangers, composed of 180°coverage of galvanized sheet metal and high density, pre-formed, rigid insulation. Where rollers are required, shield shall be steel pipe.

K. Hangers for horizontal lines shall be vertically adjustable to obtain pitch requirements of Piping Paragraph.

2.8 SLEEVES AND PENETRATIONS

A. Pipe Sleeves

1. Sleeves through floors and through exterior, structural and fire rated construction shall be hot dipped galvanized Schedule 40 steel pipe.

2. Sleeves through partitions and non-fire rated construction shall be 26 gauge galvanized steel with lock longitudinal seams, or approved plastic pipe.


B. Duct Sleeves and Openings

1. Sleeves through floors, through exterior structure, through fire rated construction and through smoke partitions that require smoke dampers shall be Schedule 40 galvanized steel pipe for round duct and shall meet SMACNA Fire Damper and Heat Stop Guide for rectangular and flat oval ducts. Fireproof packing shall be applied to seal any openings between sleeve and wall. Materials shall maintain the fire rating of the wall, and shall be installed in accordance with the SMACNA Fire Damper and Heat Stop Guide.

2. Openings in walls, partitions and other fire rated construction that do not require smoke dampers shall meet NFPA 90A, Section 3.8.


C. Pipe Sleeve Packing

1. Packing between the pipe and the sleeve (or wall or slab opening) in fire rated walls or slabs shall be a combination of fireproof insulation and fireproof caulk. The combination of materials shall have the same fire rating, in hours, as the wall or slab, as tested in accordance with the latest edition of ASTME 814 (UL 1479). The combination of materials shall be classified by UL, (fill, void or cavity materials) for the fire rating required and shall be listed as a numbered system in the UL Fire Resistance Directory. Fiberglass shall not be used as the insulation material.

2. Acceptable fireproof insulation materials shall be: Kaolin (Kaowool by Babcock and Wilcox); ceramic fiber blanket (Fiberfrax by Standard Oil) or fire rated mineral wool (Thermafiber by USG). Acceptable fireproof caulks shall be: Silicone (Firestop by Dow...
Corning, Hilti CS240); ceramic fiber (Fyreputty by Standard Oil) or intumescent synthetic elastomer (Fire Barrier Caulk by 3M, Hilti CS2420).

3. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fibre or mineral fibre with approved sealant. Pack or foam to within 1" of both wall surfaces. Seal penetration packing with approved caulking and paintable water proof mastic surface finish or silicone caulking.

4. All materials must be installed in accordance with manufacturer’s instructions; all gaps must be sealed. Finish caulk flush with wall or slab surface if piping runs exposed.

D. Other Waterproof Pipe Penetrations

1. Modular mechanical penetration seals shall be interlocking synthetic rubber links shaped to fill annular space continuously, with galvanized carbon steel bolts, nuts and pressure plates to expand rubber seal between pipe and sleeve. Sleeve seal shall be water tight.

2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed cell elastomeric seal (non-fire rated) or preformed mineral fiber or silicone foam seal (fire rated).

3. Provide water proof 1" single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations of existing slabs on grade and existing walls below grade.

2.9 ESCUTCHEONS AND DUCT COLLARS

A. Provide adjustable escutcheons on exposed piping that passes through finished floors, walls and ceilings. Escutcheons shall be chromium plated cast brass, sized to cover sleeve opening and to accommodate pipe and insulation.

B. Provide 4" wide 20 gauge galvanized sheet metal collars at sleeves and prepared openings, sized to cover entire duct penetration including sleeve and seal, and to accommodate duct and insulation as necessary. Edges shall have milled lips ground smooth. Paint to match finish of duct or as directed by Designer.

C. Provide #316 stainless steel/No. 4 finish collar for emergency generator exhaust piping which passes through exterior wall.

2.10 EQUIPMENT INSULATION

A. General

1. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.

2. No leaks in vapor barrier or voids in insulation will be accepted.

3. Insulation shall be CertainTeed, Knauf, Manville or Owens Corning and shall be installed in strict accordance with manufacturer's recommendations.

4. Insulate the following equipment:
   a. Chiller (Unless Factory Insulated)
   b. Drain pans
   c. Duct mounted coils
   d. Pumps
5. Insulation shall be 1" thick fibrous glass rigid block or semirigid board rated for temperature intended. Insulation shall be formed or fabricated to fit equipment. Ensure tight fit. Bevel edges and butt and stagger joints.

B. Secure with bands or wires at intervals recommended by manufacturer, no more than 12" centers. Provide corner angles.

C. Set cellular glass insulation and seal joints with bedding compound. Fill mineral fiber joints with insulating cement.

D. Apply two coats of adhesive with fibrous glass cloth embedded in first coat before application of second. Dry film thickness of finish shall be 1/8". Apply insulating cement over coated insulation; do not coat removable sections.

E. Equipment which needs servicing, such as pumps and plate heat exchangers shall be provided with removable insulation sections. Coordinate method of insulating plate heat exchanger with exchanger manufacturer.

2.11 FAN COIL UNITS

A. Shall be single wall four pipe model of insulated full cabinet with access panels as required to access all serviceable parts easily, and shall comply with the performance and arrangements as indicated on drawings, and as specified herein. Cabinet shall be so designed to:

1. Exposed ceiling hung design so that it can be mounted snug to underside of hung ceiling, with attractive baked enamel finish.
2. Allow full access to the main components from the bottom access panel.
3. Easy replacement of filters.
4. Piping connections made within the cabinet to be fed from above in the ceiling space. Condensate drain to be connected external to the unit casing.
5. Stamped metal integral return air grilles.
6. Double deflection extruded aluminum supply air grilles for exposed units.
7. Supply duct connections for ceiling recessed units.
8. Full size ceiling return panel with double hinges, stamped integral return air grilles and custom telescoping duct extension for ceiling recessed units.

B. Coils:

1. Water coils shall be ARI rated and 100% underwater pressure-tested at 350 psi with 300 psi working pressure and shall meet the scheduled performance data.
2. Copper tubes shall be constructed as 1/2” O.D. with .017” wall thickness; tubes shall be staggered for maximum heat transfer.
3. Aluminum fins shall be evenly spaced, high-efficiency, .0045” thick double-sine with rippled edges spaced at 12-fins-per-inch.
4. Manual air vent shall be provided standard on all hydronic coils.

C. Cabinet:
1. Basic unit construction shall be heavy 18-20 gauge galvanized steel, including framing, top panels, side panels and front panels.

D. Cabinet Insulation:

1. All units shall have 1/2 inch thick, over three-pound density neoprene-coated fiberglass. This type of insulation has greater thermal efficiency and lower noise levels.

E. Drain Pans:

1. Units shall be provided with IAQ type chilled water condensate drain pan and pipe connection auxiliary condensate drain pan.
2. Drain pans shall be constructed of 18-gauge galvanized steel with welded seams, powder-coated epoxy with 1/2” closed cell insulation.
3. Drain pans shall have primary and secondary drain connections. Units may be provided with an extended drain pan at the coil connection end to provide control of condensate from valves and piping.
4. Provide condensate pan overflow sensor equipped with dry contact for ATC to shut off the unit.

F. Blowers:

1. Double-width, double-inlet, forward curved blade and centrifugal wheels that are statically and dynamically balanced and generously sized for low-outlet velocities and quiet operation. Blower scrolls and wheels shall be galvanized for rust-free operation, and permanently lubricated ball bearings ensure long-service life.
2. The fan motor panel shall be easily removed by two to four wing-nuts.
3. Blower assembly wiring shall be enclosed in plastic tubing on cabinet models and conduit on basic models to further ensure whisper-quiet operation.
4. Fans shall be selected to deliver scheduled CFM while assuring that resultant noise level does not exceed NC 40 with 10 dB room absorption factor assumed.

G. Motors:

1. Field wiring shall be provided to junction box for single-point field connection.
2. Brushless DC Motor: Brushless DC or electronically commutated (ECM) DC motor with permanent magnet rotor. Brushless DC motor shall be furnished with an integral microprocessor based controller that includes sensor-less constant flow operation by automatically adjusting to performance in response to system pressure changes at the design CFM output based on preset three speed logic; Pre-set residential speed tapped motors are not acceptable.

H. Piping Packages:

1. Provide a standard factory assembled valve piping package to consist of a 2-way, on/off, motorized electric control valve and two ball isolation valves. Control valves shall be piped normally closed to the coil. Maximum entering water temperature on the control valve shall be 200°F, and maximum close-off pressure 30 PSIG. Maximum operating pressure shall be 300 PSIG.
2. Piping packages shall be completely factory assembled, including interconnecting pipe, and mounted inside the unit in a serviceable location over the coil and primary drain pan.

I. Controls:

1. All Fan Coil Unit controls to be furnished and installed by the ATC subcontractor. Coordinate as required.

J. Fan coil units shall be Enviro-Tec model scheduled on drawings, or equal by JCI, Ritting, Williams or Trane. Maximum depth shall not exceed 12”.

2.12 MOTORS, STARTERS AND WIRING

A. Provide motors and controls for HVAC equipment, except units served by MCC provided under Section 260001, ELECTRICAL WORK. Provide control and other related wiring including interlocks. Power wiring (to panelboards, disconnect switches, starters and motors) will be provided under Section 260001, ELECTRICAL WORK. Starters that are not integral to equipment will be furnished, installed and wired under Section 260001, ELECTRICAL WORK.

B. Unless otherwise specified, motors shall be NEMA Design B, constant speed, self ventilated squirrel cage induction. Motors shall have 1.15 service factor unless totally enclosed. Motors shall have Class B insulation.

1. Motors under 1/2 hp, shall be designed for 120 V, 60 Hz, single phase, unless otherwise specified.
2. Motors 1/2 hp and over shall be as required in schedules.

C. All motors shall be high or premium efficiency type. They shall conform to NEMA Standard MG 1 12.53a and shall have their efficiencies determined in accordance with IEEE Standard 112 Method B. The NEMA nominal efficiency shall be listed on the motor nameplate. Minimum nominal efficiencies shall be as follows:

<table>
<thead>
<tr>
<th>Size (HP)</th>
<th>Nominal Efficiency (Min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3</td>
<td>84%</td>
</tr>
<tr>
<td>5 - 7 1/2</td>
<td>88.5%</td>
</tr>
<tr>
<td>10 - 25</td>
<td>90%</td>
</tr>
<tr>
<td>30 - 100</td>
<td>93%</td>
</tr>
</tbody>
</table>

D. Starters furnished integral to equipment, and that require interlocks or remote control shall be magnetic with HAND OFF AUTOMATIC switch in cover. Provide magnetic starters as necessary, with auxiliary contacts, buttons and switches in required configurations. Refer to paragraph AUTOMATIC TEMPERATURE CONTROLS and to Control Drawings for interlock requirements.

1. Each 3 phase, 60 Hz motor shall be provided with magnetic starter with either ON OFF push button or hand off automatic switch.
2. Other motors shall be provided with a manual starter with ON OFF switch.
3. Control relay for each starter shall be for operation on 120 V, single phase, and transformer of sufficient capacity within starter case shall be furnished for this purpose.
4. Provide inverse time limit overload and under voltage protection in each leg and with pilot lights. Provide red and green On Off pilot lights.
5. Provide nameplates with engraved white lettering to designate area and equipment served.
6. Starters for refrigeration machines shall be furnished by unit manufacturer.
7. Provide starters for two speed motors with deceleration relay.
8. Furnish for all single speed motors, 25 hp and above, 95% power factor correction capacitors. Capacitors shall be in NEMA enclosure of the same rating as the motor's starter.

2.13 CHEMICAL TREATMENT - WATER SYSTEMS

A. Provide treatment systems and service for primary water systems. Do not operate systems without water treatment. Water treatment chemicals shall be by Barclay, Dearborn, Olin or Mogul. Pump and chemical drums shall be by the manufacturers of the chemicals or Liquid Metronics. Dearborn and Liquid Metronics model numbers are used to establish standards of quality.

B. Provide piping necessary for complete systems.

C. Water treatment shall include feeding devices necessary to feed chemical solution into piping system and bring chemical properties of water to within manufacturer's recommended operating limits, in order to minimize corrosion and reduce build up of slime or other contaminants.

D. Furnish and install a coupon rack capable of accepting six coupons in each chemically treated system. The chemical treatment contractor shall make recommendations as to the use of coupons and shall include the furnishing and analysis of the coupons/system (steel and copper) each month.

E. Closed loop systems (chilled water and heating hot water) shall have water treatment consisting of Dearborn Model Type AV By-Pass Shot Feeder, to feed chemical solution into each piping system. Chemicals shall be Dearborn B-524 (Nitride Corrosion Inhibitor) to maintain control limits at 800-1000 parts per million of sodium nitrite). Below 1000 gpm of system flow, a five gallon shot feeder shall be provided. From 1001 to 2500 gpm, provide a 50 gallon tank, pump set and agitator.

F. Water treatment for open condenser water system shall consist of:
   1. Equipment
      a. Provide one Hydac Modu-Max Control System, or equal by Uniloc, Lakewood or Great Lakes consisting of:
         1) Control box enclosure, NEMA 12 cabinet, 20 amperes 115V with internal circuit breakers.
         2) PH-TDS Conductivity Monitor and Control Module.
         3) Flow-through type probe assembly with flow control shut-off; pressurized, pre piped and mounted.
4) Digital display read-out for conductivity and PH controller.
5) Electric contacting water meter.
6) Water meter totalizer.
7) Solenoid bleed valve, suitable for outdoor environment.
8) Counter timer control module for inhibitor feed.
9) Biocide programmable module - dual pumps.

b. Water meter and solenoid bleed valve shall be sized as follows:

<table>
<thead>
<tr>
<th>System Capacity</th>
<th>Solenoid Bleed Valve Size</th>
<th>Water Meter Size</th>
<th>Water Meter Gallons per Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 400 tons</td>
<td>3/4&quot;</td>
<td>3/4&quot;</td>
<td>10</td>
</tr>
<tr>
<td>401-900 tons</td>
<td>3/4&quot;</td>
<td>1&quot;</td>
<td>50</td>
</tr>
<tr>
<td>901-1500 tons</td>
<td>1&quot;</td>
<td>1 1/2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>1501-3000 tons</td>
<td>1 1/2&quot;</td>
<td>2&quot;</td>
<td>100</td>
</tr>
</tbody>
</table>

c. Provide three (3) chemical metering pumps as follows:
1) System size under 900 tons, Liquid Metronics AISI-191S, 24 gpd, 110 psi.
2) System size above 900 tons: Liquid Metronics B111-95S, 30 gpd, 150 psi.
3) If local water conditions warrant, provide an additional caustic or acid pump, of capacities listed above.

2. Chemical
   a. Provide Dearborn C-381 cooling water inhibitor maintaining control limits of 100-125 parts per million and pH of 8.0 to 8.5.
   b. Provide Dearborn A-100 and A-111 algaecides or provided equal.

G. Flush and clean all systems with Dearborn BC 45 cleaner after completion of installation. After cleaning, add Dearborn B-524 nitrite inhibitor to closed loop systems, to control nitrite strength to 800 1,000 ppm maximum. Submit written report indicating that systems have been thoroughly cleaned and charged with corrosion inhibitor.

H. Effluent from HVAC system discharged to sewer shall meet requirements of applicable local, state and national water quality standards.

I. One year service shall include, but not be limited to, the following:
   1. Delivery and maintenance of water treatment chemicals for one year.
   2. Collection and analysis of samples of circulating water every thirty days for one year, and adjustments to the rate of chemical feed to suit each system.
   3. Inspection and maintenance chemical feeding devices for one year. Inspection and maintenance should be performed at minimum intervals of every thirty days.
   4. Water tests according to project requirements.

J. Mechanical contractor shall provide the steel support shelf for the chemical feed pumps.

K. Electrical Wiring and Controls Interlocking
1. Provide all necessary interlocking between solenoid bleed valve and respective conductivity controller. Provide power wiring for solenoid valves, pumps and controller.

2.14 PRESSURE GAUGES, THERMOMETERS AND TEST PLUGS

A. Provide bronze Bourdon tube pressure gauges where shown on Drawings and where specified, by U.S. Gauge, Trerice, or Weksler, accurate to +1%.

1. Gauges shall have white faces with black filled engraved lettering. Gauge bodies shall be set in phenolic cases. Provide siphons and shut off cocks.
2. Gauges shall be easily accessible and easily read. Gauges readable from floor at less than five feet shall have 4 1/2" dials. Other gauges shall have 6" dials. Gauges graduations shall meet limit requirements of normal operation. Gauge shall indicate at mid scale.

B. Provide separable well V case thermometers by U.S. Gauge, Trerice, or Weksler where shown on Drawings and where specified. Thermometers shall have 9" scale and white face with black filled engraved letters. Thermometers shall be angular or straight stemmed, as conditions necessitate. Thermometer wells shall be bronze and shall be installed so as to ensure minimum restriction of water flow in pipe.

1. Provide thermometer ahead of and beyond cooling coils, in pump suctions and discharges, and where shown on Drawings. Thermometers shall have scale range of 0° to 120°F with 2°F scale division.
2. Provide thermometer in condenser water system at each chiller, cooling tower and pump connection. Scale range shall be 20° to 180°F with 2°F scale division.
3. Provide thermometer in hot water system at each boiler, coil and pump connection, unless specified otherwise. Scale range shall be 30° to 300°F with 2°F scale division.
4. Provide additional thermometers where shown on Drawings.

C. Combination Pressure/Temperature Test Plugs

1. Provide in the supply and return piping at VAV boxes, duct coils, unit ventilators, and fan coil units, combination pressure temperature test plugs by Peterson Equipment Company "Petes Plug" or Sisco, Inc. "P/T Plugs".
2. Plug shall be 1/4" or 1/2" NPT, constructed of solid brass with a Nordel valve core suitable for temperatures up to 350°F. Plug shall be rated zero leakage from vacuum to 1000 psig.
3. Provide extension fitting for each plug suitable for use with 2" maximum pipe insulation.
4. Provide gauge test kit consisting of the following items:
   a. (2) 3-1/2" dial face gauges 0 100 psi and 0 231 feet.
   b. (2) Gauge adapters with 1/8" O.D. probe.
   c. (2) 5" stem pocket testing thermometers ranges 25 125°F; 0 220°F.
   d. (1) Carrying case.
   e. (2) 4' length of flexible hose with adapters.
2.15 FLOW ELEMENTS

A. Provide primary flow measuring elements and sensors in chilled water systems and where shown on Drawings.

B. Provide 1/2" steel weld coupling, welded to pipe. Sensor shall be Type 316 stainless steel.

C. Install elements as required by manufacturer.

D. Provide portable differential pressure meter of same manufacture as element. Scale shall be zero base, linear to DP with 6" meter.

E. Elements shall be Dietrich Standard Corp. Annubar Model GCR as recommended by manufacturer or equivalent by Preso.

F. Provide pressure meter by Dietrich Standard, or Preso with zero base scale, linear to DP with 6" meter. Flow element readings shall not be more than 75% nor less than 25% of meter scale.

2.16 FILTERS MEDIUM EFFICIENCY, THROW AWAY TYPE


B. Provide dry type air filter gauge, with scale of 0 to 2" across filter. Gauge shall include appropriate static pressure tips, vent valves and tubing. Gauge shall be suitably marked to indicate when filter should be changed, and shall be Dwyer Magnahelic Type or approved equal.

C. Filters shall be Farr, Cambridge or AAF, as scheduled on Drawings. Filters shall be listed by Underwriters Laboratories, Class 2.

D. Holding frames for filters shall be 16 gauge galvanized steel with polyurethane foam gaskets and fasteners. Frame shall be Farr, Type 8, or equivalent by other named manufacturers.

E. Furnish and install a final set of air filters at the end of the project.

2.17 VARIABLE VOLUME TERMINAL UNITS (NON-FAN POWERED)

A. Provide single duct variable volume air control assemblies of sizes and capacities shown on Drawings. Acceptable manufacturers shall be: Titus, Enviro-Tec, Trane, Metal-Aire. Units shall be 24 gauge galvanized steel, lined with 1-1/2 pound insulation as required by UL 181 and NFPA 90A.

1. Provide damper motor suitable for DDC control.
2. Responsibility for the provision of damper actuator, DDC VAV box controller including velocity pressure transducer and control transformer shall be under the Automatic Temperature Controls paragraph of this specification. Terminal box manufacturer shall include with his bid, costs of mounting the controller on his box and piping the
controller's transducer to his flow sensor (in accordance with control manufacturer’s instructions).

B. Provide 3’ long sound attenuators where indicated on the Drawings.

C. Boxes shall have multi-point averaging type airflow sensors. Boxes with single point sensors are unacceptable.

D. Assemblies shall be pressure independent between supply unit's external static pressure and minimum static pressure schedule on Drawings. Valves shall be normally open or normally closed as shown on Schedules. Differential static of complete assembly shall not exceed 0.45" wg for units with sound attenuators or 0.20" wg for units without. Damper leak rate shall not exceed 2% of full volume at 3" static pressure rated by ADC. Units shall not deviate from set minimum or maximum flow settings by more than 10% regardless of inlet angle. Inlet velocities shall not exceed 2250 fpm.

E. Sound ratings shall not exceed noise criteria NC 30 level unless otherwise scheduled on the Drawings. All NC data must be in accordance with ADC 1062 R4. Discharge NC data shall include 10db room attenuation only. Radiated NC data is to assume a ceiling with sound transmission class 35 39.

F. Terminal units shall be capable of the heating and cooling operation sequences and quantities shown on the schedule, plan and control drawings. Units' control apparatus shall be compatible with the control system.

G. The mechanical division contractor shall have complete responsibility for ensuring that the submitted terminal box and VAV DDC controller are compatible with each other, and that they can perform all sequences of operation shown on the control drawings. Contractor shall submit the following items with his shop drawing submittal:

1. The name of the terminal box manufacturer.
2. The name of the temperature controls manufacturer.
3. A statement that the mechanical division contractor has contacted both vendors and verified that the terminal box and DDC controller are compatible with each other.

H. Provide hot water heating coils as indicated on drawings.

2.18 VIBRATION ISOLATION (NON-SEISMIC)

A. General

1. Manufacturer Responsibility
   a. Manufacturer of vibration equipment shall have the following responsibilities:
      1) Guarantee specified isolation system deflections.
      2) Provide installation instructions, drawings and field supervision to insure proper installation and performance of systems.

2. Quality Assurance
a. All vibration isolators shall have calibration markings or some method to determine adjustment, the actual deflection under the imposed load after installation and adjustment.

b. All isolators shall operate within the linear position of their load vs. deflection curves. Load vs. deflection curves shall be furnished by the manufacturer and must be linear over a deflection range of not less than 50% above the design deflection.

c. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than +10%.

d. Substitution of internally isolated equipment in lieu of the isolation specified in this section, is acceptable provided all conditions of this section are met. The equipment manufacturer shall provide a letter of guarantee stating that the specified noise and vibration levels will be obtained or the cost of converting to the specified external vibration isolation shall be born by the equipment manufacturer.

e. The following specifications describe spring hangers with 30 degree misalignment feature. This requirement is mandatory. the Contractor shall replace any hangers without the 30 degree capability discovered on site at no additional cost to UMA.

B. Products

1. Description
   a. All vibration isolation devices shall be the product of a single manufacturer. Products of other manufacturers are acceptable provided their systems strictly comply with intent, structural design, performance, and deflections of the base manufacturer.
   b. Acceptable manufacturers of vibration isolation products shall be: Mason Industries, Amber Booth Company, Peabody Noise Control, Korfund Dynamics Corporation, Vibration Mountings and Equipment, Vibration Eliminator Co., provided they meet the requirements of this specification. Mason Industries model numbers have been used in this specification to establish quality of components, but are in no way to limit competitive bidding by other manufacturers.
   c. Refer to Table A at the end of this article for application of the various types listed to appropriate equipment and efficiency level.

2. Vibration Isolation Types
   a. Vibration Isolators
      1) Type A: Spring Isolator
         a) Having a minimum OD to OH of 0.8:1.
         b) Corrosion resistance where exposed to corrosive environment with:
            2) (Springs cadmium plated or electro-galvanized.
            3) (Hardware cadmium plated.
            4) (All other metal parts hot-dip galvanized.
               a) Reserve deflection (from loaded to solid height) of 50% of rated deflection.
               b) Minimum ¼" thick neoprene acoustical base pad on underside.
               c) Designed and installed so that ends of springs remain parallel.
               d) Non-resonant with equipment forcing frequencies or support structure natural frequency.
e) Mason Ind. Type SLF

5) Type B: Spring isolator shall be the same as Type A with the following additional features:
   a) Built-in vertical limit stops with minimum ¼" clearance under normal operation.
   b) Tapped holes in top plate for bolting to equipment.
   c) Capable of supporting equipment at fixed elevation during equipment installation. Installed and operating heights shall be identical.
   d) Adjustable and removable spring pack with separate neoprene isolation pad.

6) Mason Ind. Type SLR

7) Type C: Spring hanger rod isolator.
   a) Spring element seated on a steel washer within a neoprene cup incorporating a rod isolation bushing.
   b) Steel retainer box encasing the spring and neoprene cup.
   c) When used on ductwork, provide eyebolts for attachment to duct straps.
   d) Mason Ind. Type H5, WHS

8) Type D: Double deflection neoprene mountings.
   a) All metal surfaces shall be neoprene covered and have friction pads top and bottom.
   b) Be capable of .035" deflection at rated load.
   c) Steel rails shall be employed to compensate for overhang on units such as small vent sets, close coupled pumps, etc.
   d) Mason Ind. Type ND or Rails Type DNR.

9) Type E: Elastomer hanger rod isolator.
   a) Molded (min. 1-3/4" thick) neoprene element with projecting bushing lining the rod clearance hole. Static deflection at rated load shall be a minimum of 0.35".
   b) Steel retainer box encasing neoprene mounting capable of supporting equipment up to four times the rated capacity of the element.
   c) Mason Ind. Type HD

10) Type F: Combination spring/elastomer hanger rod isolator.
    a) Spring and neoprene elements in a steel retainer box with the features as described for Type A and E isolators.
    b) Mason Ind. Type DNHS

11) Type G: Pad type elastomer isolator.
    a) 0.75" minimum thickness, 50 psi maximum loading, ribbed or waffled design.
    b) Minimum 0.1" deflection.
    c) 1/16" galvanized steel plate between multiple pad layers.
    d) Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area (Type "GM").
    e) Mason Ind. Type Super W pad.

12) Type H: Pad type elastomer isolator.
    a) Laminated canvas duct and neoprene, maximum loading 1,000 psi, minimum ½" thick.
b) Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area (Type HM).

c) Mason Ind. Type HL Pad.

d) **NOTE:** When bolting is required, neoprene and duck washers and bushings shall be provided to prevent short circuiting.

13) Type J: Steel Rails
   a) Steel members of sufficient strength to prevent equipment flexure during operation.
   b) Height saving brackets as required to reduce operating height and cradle the unit.
   c) Mason Ind. Type ICS

14) Type K: Pipe anchors
   a) All directional acoustical pipe anchor, consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum ½" thickness of Type H pad.
   b) Vertical restraints shall be provided by a similar material arranged to prevent vertical travel in either direction.
   c) Allowable loads on isolation materials shall not exceed 500 psi. And the design shall be balanced for equal resistance in any direction.
   d) Mason Ind. Type ADA

15) Type L: Isolated clevis hanger
   a) Combination clevis or rod roller hanger and a Type C, (LC), E (LE), or F (LF) isolation hanger.
   b) System shall be precompressed to allow for rod insertion and standard leveling.
   c) Mason Ind. Type CIH

C. Execution

1. General
   a. Isolation systems must be installed in strict accordance with the manufacturer's written instructions. Vibration isolators shall not cause any change of position of equipment resulting in stress on equipment connections.

2. Equipment Installation
   a. Equipment shall be isolated as per Table A at the end of this section.
   b. Additional Requirements
      1) The minimum operating clearance under other bases shall be 1-1/2".
      2) All bases shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine, isolators.
      3) The isolators shall be installed without raising the equipment.
      4) After the entire installation is complete, and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators are properly adjusted, shall be barely free and shall be removed. Remove all debris from beneath the equipment and verify that there is no short circuits of the isolation. The equipment shall be free in all directions.
      5) Install equipment with flexibility in wiring.

3. Piping and Ductwork Isolation
   a. All piping and ductwork is included in this section.
b. Installation
1) Isolate piping and ductwork outside shafts as follows:
   a) All in mechanical rooms.
   b) All exposed on roof.
   c) All within 50 ft. or 100 pipe diameters (whichever is greater) from connected rotating or reciprocating equipment and pressure reducing stations.
   d) Control air piping, from compressor discharge to receiver.
2) The isolators shall be installed with the hanger box attached to, or hung as closely as possible to the structure.
3) The isolators shall be suspended from substantial structural members sized for 0.08\" deflection at center of span, not from slab diaphragm, unless specifically permitted.
4) Hanger rods shall not short circuit the hanger box.
5) Horizontal suspended pipe 1¼\" to 2\" and all steam piping shall be supported by Type E isolators with a minimum 3/8\" deflection. Water pipe larger than 2\" shall be supported by Type F isolators with a minimum 1\" deflection or same deflection as equipment for the first 3 locations nearest equipment whichever is greater.
   a) Type L hangers may be substituted for the above.
6) Ductwork shall be supported by Type C (WHS) hangers.
7) Horizontal floor and roof supported pipe shall be the same as C.3.b.5 except use isolators Type D and Type A, respectively.
8) Vertical riser pipe supports under 2\" diameter shall utilize Type H isolation.
9) Vertical riser guides, if required shall avoid direct contact of piping with the building.
10) Pipe anchors or guides where required, shall utilize Type K isolators.
11) Riser sway supports, where required, shall utilize two (2) neoprene elements (Type G or H) to accommodate tension and compression forces.
12) Pipe extension and alignment connectors: Provide Type FC-2 connectors at riser takeoffs, cooling and heating coils and elsewhere as required to accommodate thermal expansion and misalignment.
13) Install Type FC-1 flexible connectors at all connections of pipe to equipment such as pumps, chillers, cooling towers and as shown on the drawings.
14) Install FC-2 type connectors at all locations which exceed temperature limitations of FC-1.
15) For control air piping, provide two flexible connectors Type FC-2 90° to each other in the compressor discharge piping to the receiver. When the receiver is remote from the compressor, isolate the piping between the compressor and receiver with Type C isolators having 3/8\" deflection. The receiver shall be isolated with Type D isolators having 3/8\" deflection.

4. Inspection
   a. Upon completion of installation of all vibration isolation devices, the local representative shall inspect the complete project and certify in writing to the Contractor that all systems are installed properly, or require correction. The Contractor shall submit a report to UMA’s Project Manager, including the
representative's report. Certifying correctness of the installation or detailing corrective work to be done.

TABLE B

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>HP</th>
<th>MTNG</th>
<th>NON-CRITICAL</th>
<th>CRITICAL</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ISOL</td>
<td>DEFLECT</td>
</tr>
<tr>
<td>Air Cooled Cond. or Chillers</td>
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<tr>
<td>Base Mounted Pumps to 15</td>
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<td></td>
<td>D</td>
<td>.30</td>
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<tr>
<td>&gt; 15</td>
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<td>D</td>
<td>.30</td>
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<tr>
<td>Unit/Cab. Heaters</td>
<td></td>
<td>Clg</td>
<td>-</td>
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</tbody>
</table>

*Used on vertically arranged units. Rails to be 1½ times the unit height.

** Substitute TYPE B isolator for roof installations.

*** Substitute TYPE B-2 base for Class 2 & 3 fans.

5. Notes:
   a. "ISOL" and "BASE" column indicates letter type as appears in the specs.
   b. "MTNG" refers to method of support of equipment from the structure.
   c. "SEE GUIDE" indicates isolator deflection selection to be taken from RPM/DEFLECTION Guide at bottom of table.

2.19 VIBRATION ISOLATION (SEISMIC)

A. General

1. Description
   a. Provide the necessary vibration isolation materials to eliminate excessive noise and vibration from being transmitted from the equipment to the occupied areas of the structure and also serve as the basis for seismic restraint design for the entire mechanical system within the building (see definitions). Provide isolation materials and seismic restraints complete as shown and specified.
   b. The work in this section includes the following:
      1) Vibration isolation elements for equipment.
      2) Equipment isolation bases.
      3) Piping flexible connectors.
      4) Seismic restraints for isolated equipment.
      5) Seismic restraints for non-isolated equipment.
6) Certification of seismic restraint designs, and installation supervision.
7) Certification of seismic attachment of housekeeping pads.

c. Definitions: The term EQUIPMENT will be used throughout this specification and it includes all non-structural components within the facility and 5 feet outside the facility that is not buried underground including but not limited to:

<table>
<thead>
<tr>
<th>Air Distribution</th>
<th>Condensers</th>
<th>Piping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabinet Heaters</td>
<td>Var. Freq. Drives</td>
<td>Chillers</td>
</tr>
<tr>
<td>Ductwork</td>
<td>Rooftop Units</td>
<td>Fans</td>
</tr>
</tbody>
</table>

2. Certification and Analysis

a. Seismic restraint calculations must be provided for all connections of equipment to the structure.
b. Calculations to support seismic restraint designs stamped by a structural, civil engineer or professional mechanical engineer.
c. A seismic design liability insurance certificate must accompany all submittals.

3. Code and Standards Requirements

a. BOCA
b. SMACNA Guidelines for seismic restraint of mechanical system
c. NFPA - 13 and 14
d. All State and local codes.

4. Manufacturer Responsibility

a. Manufacturer of vibration and seismic control equipment shall have the following responsibilities:
   1) Determine vibration isolation and seismic restraint sizes and locations.
   2) Provide equipment vibration isolation and seismic restraints as scheduled or specified.
   3) Guarantee specified isolation system deflections.
   4) Provide installation instructions, drawings and field supervision to insure proper installation and performance of systems.
b. Manufacturer's working in this section must provide a seismic design errors and omissions insurance certificate with their bid to certify their ability to provide engineering and design as required by this section.

5. Quality Assurance

a. All vibration isolators shall have calibration markings or some method to determine the actual deflection under the imposed load after installation and adjustment.
b. All isolators shall operate within the linear portion of their load vs. deflection curves. Load vs. deflection curves shall be furnished by the manufacturer and must be linear over a deflection range of not less than 50% above the design deflection.
c. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than +10%.
d. Substitution of internally isolated and restrained equipment in lieu of the isolation and restraints specified in this section is acceptable provided all conditions of this section are met. The equipment manufacturer shall provide a letter of guarantee.
stamped and certified per paragraph A.2 stating that the specified noise and vibration levels will be obtained and that the restraints are in compliance with these specifications or all costs of converting to the specified external vibration isolation and/or restraints shall be born by the equipment manufacturer.

e. The following specifications describe spring hangers with 30 degree misalignment feature. This requirement is mandatory. The Contractor shall replace any hangers without the 30 degree capability discovered on site at no additional cost to UMA.

B. Products

1. Description
   a. All vibration isolation and seismic devices shall be the product of a single manufacturer.
   b. Acceptable manufacturers of vibration isolation products shall be: Mason Industries, Amber Booth Company, Peabody Noise Control, Korfund Dynamics Corporation, Vibration Mountings and Equipment, or Vibration Eliminator Co. provided they meet the requirements of this specification. Mason Industries model numbers have been used in this specification to establish quality of components. Products of the other listed manufacturers are acceptable provided their systems strictly comply with intent, structural design, performance and deflections of the base manufacturer.

2. Seismic Restraints and Vibration Isolation Types
   a. General
      1) Shall be capable of accepting, without failure, one-half "G" external forces, one "G" for life safety equipment. Shall maintain the equipment in a captive position, and not short circuit isolation during normal operating conditions. Isolators shall have provisions for bolting and welding to the structure.
      2) Attachment plates to be cast into housekeeping pads, concrete inserts, beam clamps, etc. that may be required for seismic compliance, shall be provided by this section.
      3) Housekeeping pad attachment shall be designed and certified by this section. Materials and labor required shall be by the concrete section of these specifications.
   b. Seismic Restraints
      1) Type I: Shall comply with general characteristics of spring isolator Type A with the following additional features. Isolator shall incorporate snubbing restraint in all directions, and be capable of supporting equipment at fixed elevations during installation, and have a one "G" rating. Cast or aluminum housings, except ductile iron, are not acceptable.
         a) Mason Ind. type SSLFH.
      2) Type II: Each corner or side of equipment base shall incorporate a seismic restraint having a minimum of 5/8" thick, all directional resilient pad limit stop. Restraints shall be fabricated of plate, structural members or square metal tubing. Angle bumpers are not acceptable. Isolator shall have a one "G" acceleration rating.
         a) Mason Ind. Type Z-1011 or Z-1225.
      3) Type III: Multiple metal cable type with approved fastening devices to equipment and structure. System to be field bolted to deck or overhead
structural members using two sided beam clamps or appropriately designed inserts for concrete. All parts of the system including cables, and excluding fasteners are to be of a single supplier to assure seismic compliance.

a) Mason Ind. Type SCB Seismic Restraining System

4) Type IV: Double deflection neoprene isolator (min. 0.3") encased in ductile iron or steel casing. Isolator shall have one "G" acceleration rating.
   a) Mason Ind. Type BR or RBA.

5) Type V: Non-isolated equipment shall be field bolted or welded (powder shots not acceptable) to the structures as required to meet seismic forces. Bolt diameter, imbedment data, and/or weld length must be shown in certified calculations as required by paragraph A.2 above.

c. Vibration Isolators

1) Type A: Spring Isolator
   a) Having a minimum OD to OH of 0.8:1.
   b) Corrosion resistance were exposed to corrosive environment with:

2) (Springs cadmium plated or electro-galvanized.

3) (Hardware cadmium plated.

4) (All other metal parts hot-dip galvanized.
   a) Reserve deflection (from loaded to solid height) of 50% of rated deflection.
   b) Minimum ¼" thick neoprene acoustical base pad on underside, unless designed otherwise.
   c) Designed and installed so that ends of springs remain parallel.
   d) Non-resonant with equipment forcing frequencies or support structure natural frequency.
   e) Mason Ind. Type SLF.
   f) NOTE: SEISMIC RESTRAINT II must be used with type A spring isolator.

5) Type B: Spring isolator shall be the same as Type A with the following additional features:
   a) Built-in vertical limit stops with minimum ¼" clearance under normal operation.
   b) Tapped holes in top plate for bolting to equipment.
   c) Capable of supporting equipment at a fixed elevation during equipment installation. Installed and operating heights shall be identical.
   d) Adjustable and removable spring pack with separate neoprene isolation pad.
   e) Housing rated to accept one "G" Acceleration.
   f) Mason Ind. Type SLR.
   g) NOTE: Type B spring isolator must be bolted or welded to the structure.

6) Type C: Spring hanger rod isolator
   a) Spring element (type A) seated on a steel washer within a neoprene cup incorporating a rod isolation bushing.
   b) Steel retainer box encasing the spring and neoprene cup.
   c) When used on ductwork, provide eyebolts for attachment to duct straps.
d) Spring diameter and hanger box lower hole size shall allow 30 degree hanger rod misalignment.
e) Mason Ind. Type 30, W30.
f) NOTE: MUST BE USED WITH SEISMIC RESTRAINT III

7) Type D: Same as SEISMIC RESTRAINT IV.

8) Type E: Elastomer hanger rod isolator.
a) Molded (min. 1-3/4" thick) neoprene element with projecting busing lining the rod clearance hole. Static deflection at rated load shall be a minimum of 0.35".
b) Steel retainer box encasing neoprene mounting capable of supporting equipment up to four times the rated capacity of the element.
c) Mason Ind. Type HD.
d) NOTE: SEISMIC RESTRAINT III must be used with Type E hanger rod isolator.

9) Type F: Combination Spring/Elastomer hanger rod isolator.
a) Spring and neoprene elements in a steel retainer box with the features as described for Type C and E isolators.
b) Mason Ind. Type 30N.
c) NOTE: SEISMIC RESTRAINT III must be used with Type F hanger rod isolator.

10) Type G: Pad type elastomer isolator.
a) 0.75" minimum thickness, 50 psi maximum loading, ribbed or waffled design.
b) Minimum 0.1" deflection.
c) 1/16" galvanized steel plate between multiple pad layers.
d) Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area. (Type "GM")
e) Mason Ind. Type Super W pad.
f) NOTE: Bolting required for seismic compliance. Neoprene and duck washers and bushings shall be provided to prevent short circuiting.

11) Type H: Pad type elastomer isolator.
a) Laminated canvas duck and neoprene, maximum loading 1000 psi, minimum ½" thick.
b) Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area. (Type "HM")
c) Mason Ind. Type HL pad.
d) NOTE: Bolting required for seismic compliance. Neoprene and duck washers and bushings shall be provided to prevent short circuiting.

12) Type J: Steel Rails.
a) Steel members of sufficient strength to prevent equipment flexure during operation.
b) Height saving brackets as required to reduce operating height.
c) Mason Ind. Type ICS or R.

13) Type K: Pipe anchors.
a) All directional acoustical pipe anchor, consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum of ½" thickness of Type H pad.
b) Vertical restraints shall be provided by a similar material arranged to prevent vertical travel in either direction.

c) Allowable loads on isolation materials shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction.

d) Must be bolted or welded to meet seismic criteria.

e) Mason Ind. Type ADA

14) Type L: Isolated clevis hanger.
   a) Combination clevis or rod roller hanger and a Type C, (LC) E, (LE) or F, (LF) isolation hanger.
   b) System shall be precompressed to allow for rod insertion and standard leveling.
   c) Mason Ind. Type CIH

3. Flexible Connectors
   a. All connectors shall be installed on the equipment side of shut-off valves, horizontal and parallel to shafts whenever possible.
   b. Type FC-1: Elastomer Connector
      1) Manufactured of nylon tire cord and EPDM, both molded and cured in hydraulic presses.
      2) Straight connectors to have two (2) spheres reinforced with a molded-in, external ductile iron ring between the spheres.
      3) Rated at 250 psi/170°F, dropping in a straight line to 170 psi/250°F for sizes 1½" to 12".
      4) Sizes 10" and 12" at 200 psi and greater operating pressure, to employ control cables with neoprene end fittings isolated from anchor plates by means of ½" bridge bearing neoprene bushings.
      5) Connectors shall be pre-extended per manufacturer's recommendations to prevent elongation under pressure.
      6) Minimum safety factor of 3.6:1 at maximum pressure ratings shall be certified by test reports. Submittals shall also include two test reports by independent consultants showing minimum reduction of 20 Db in vibration accelerations and 10 Db in sound pressure levels at typical blade passage frequencies.
      7) Connectors bolted to Victaulic or approved equal type couplings or gate, butterfly or check valves to have a minimum 5/8" flange spacer installed between the connector and the coupling flange.
      8) Neoprene in lieu of EPDM is not acceptable.
   c. Mason Ind. Super-Flex Types: MFTNC or MFTFU.
   d. Type FC-2: Flexible stainless steel hose.
      1) Stainless steel hose and braid rated with 3:1 safety factor.
      2) 2" and smaller with male nipples, 2-1/2" and larger with fixed steel flanges.
      3) Lengths as follows:

        | Length | allowable loads |
        |--------|-----------------|
        | 1/2 x 9 | 2-1/2 x 12 |
        | 3/4 x 10 | 3 x 14 |
        | 1 x 11 | 4 x 15 |
        | 1-1/4 x 12 | 5 x 19 |
        | 1-1/2 x 13 | 6 x 20 |
        | 2 x 14 | 8 x 22 |
C. Execution

1. General
   a. Isolation and seismic restraint system must be installed in strict accordance with
      the manufacturer's written instructions. Vibration isolators shall not cause any
      change of position of equipment resulting in stress on equipment connections.

2. Equipment Installation
   a. Equipment shall be isolated and restrained as per Table A in this section.
   b. Additional Requirements
      1) The minimum operating clearance under other bases shall be 1-1/2".
      2) All bases shall be placed in position and supported temporarily by blocks or
         shims, as appropriate, prior to the installation of the machine, isolators and
         restraints.
      3) The isolators shall be installed without raising the equipment.
      4) After the entire installation is complete, and under full operational load, the
         isolators shall be adjusted so that the load is transferred from the blocks to
         the isolators. When the isolators are properly adjusted the blocks shall be
         barely free and shall be removed. Remove all debris from beneath the
         equipment and verify that there are no short circuits of the isolation. The
         equipment shall be free in all directions.
      5) Install equipment with flexibility in wiring.

3. Piping and Ductwork Isolation
   a. All piping and ductwork is included in this section.
   b. Installation
      1) Isolate the following piping and ductwork outside of shafts:
         a) All water and steam piping in mechanical rooms.
         b) Piping exposed on roof.
         c) Water piping and ductwork within 50 ft. or 100 pipe diameters
            (whichever is greater) from connected rotating or reciprocating
            equipment and pressure reducing stations.
         d) Control air piping, from compressor discharge to receiver.
   c. The isolators shall be installed with the hanger box attached to, or hung as closely
      as possible to the structure.
   d. The isolators shall be suspended from substantial structural members sized for
      0.08" deflection at center of span, not from slab diaphragm, unless specifically
      permitted.
   e. Hanger rods shall not short circuit the hanger box.
   f. Horizontal suspended pipe 1¼" to 2" and all steam piping shall be suspended by
      Type E isolators with a minimum 3/8" deflection. Water pipe larger than 2"
      shall be supported by Type F isolators with a minimum 0.75" deflection or same
      deflection as equipment for the first three locations nearest equipment whichever is
      greater.
      1) Type L hangers may be substituted for the above.
   g. Ductwork shall be supported by Type C hangers with 1" minimum deflection.
   h. Horizontal floor and roof supported pipe shall be the same as C.3.f except use
      isolator Type D and Type A, respectively.
i. Vertical riser pipe supports under 2" diameter shall utilize type H isolation.

j. Vertical riser guides, if required shall avoid direct contact of piping with the building.

k. Pipe anchors or guides where required, shall utilize Type K isolators.

l. Riser sway supports, where required, shall utilize two (2) neoprene elements (Type G or H) to accommodate tension and compression forces.

m. Install TYPE FC-1 (FC-4 for freon) flexible connectors at all connections of pipe to equipment such as pumps, chillers, cooling towers and as shown on the drawings.

n. Install FC-2, FC-3 or FC-4 type connectors only at locations which exceed temperature or service (such as gas, fuel oil or freon) limitations of FC-1.

o. For control air piping, provide two flexible connectors Type FC-2 90 degrees to each other in the compressor discharge piping to the receiver. When the receiver is remote from the compressor, isolate the piping between the compressor and receiver with Type C isolators having 3/8" deflection. The receiver shall be isolated with Type D isolators having 3/8" deflection.

4. Seismic Restraints

a. Installation

1) All floor mounted equipment whether isolated or not shall be bolted or welded to the structure to allow for required acceleration. Bolt points, diameter of inserts, imbedment depth and weld length as shown on the approved submittal drawings shall be followed in all respects.

2) All suspended equipment shall be four point independently braced with Type III restraints, installed taught for non-isolated equipment, piping or ductwork and slack with ½" cable deflection for isolated equipment.

   a) Piping, Schedule 10, 20 or 40 weld or Victaulic or approved equal braced at a maximum of 40 foot intervals and at turns of more than 4 feet.

   b) Piping, lateral bracing at 80 foot intervals.

   c) No-hub piping to be braced at 20 foot intervals (or 40 foot using appropriately rated seismic couplings) as required.

   d) Ductwork to be braced a maximum of every 40 feet and at every turn and at run ends. Lateral bracing shall be every 60 feet.

3) Seismic restraints are not required on the following:

   a) Gas piping less than 1" ID.

   b) Piping in mechanical equipment room less than 1¼" ID.

   c) Other piping less than 2½" ID.

   d) All rectangular ducts less than 6 sq. ft. in cross sectional area.

   e) All round ducts less than 28" diameter.

   f) All elevis hung pipe suspended by individual hangers 12" in length (6" in length for fire protection mains) or less from the top of the pipe support to the bottom of the support for the hanger.

   g) All top supported ducts suspended by hangers 12" or less in length from the top of the duct to the bottom of the support for the hanger.

4) Where base anchoring of equipment is insufficient to resist seismic forces, restraints such as Type III shall be located above the units center of gravity to suitably resist "G" forces.
5) For overhead support equipment, overstress of the building structure must not occur. Bracing may occur from:
   a) Flanges and structural beams.
   b) Upper or lower truss chords in bar joists.
   c) Cast in place inserts or drilled and shielded inserts in concrete structures.

6) Pipe risers through cored shafts require no additional seismic bracing. (Core diameters to be a maximum of 2" larger than pipe OD.)

b. Non-isolated Equipment Installation
   1) HVAC
      a) All ceiling suspended pipe and duct not excluded by diameter or distance from structure allowances.

   2) Restraint Type III or V
      a) All ceiling suspended equipment including but not limited to tanks, stacks and VAV boxes.

   3) Restraint Type III or V
      a) NOTE: If VAV units are rigidly attached to duct (no flex) they shall be considered ductwork.
      b) All diffusers in acoustical tile ceilings to be four point independently cable braced unless ceiling meets seismic Zone 2 requirements. In such case earthquake clips, or other approved means of positive attachment shall secure fixture to T-bar structure.

   4) Restraint Type III
      a) All floor mounted equipment and tanks.

   5) Base Type B-7
      a) Roof (curb) mounted, AC, H&V units, or fans to be mounted on seismically rated curbs.

   6) Base Type B-6

5. Inspection
   a. Upon completion of installation of all vibration isolation devices, the local representative shall inspect the completed project and certify in writing to the Contractor that all systems are installed properly, or require correction. The contractor shall submit a report to UMA’s Project Manager, including the representative's report. Certify correctness of the installation or detailing corrective work to be done.

### TABLE C

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HEATING, VENTILATING AND AIR CONDITIONING
230001 - 63
April 2017
**Unit/Cab. Heaters**  |  **Clg**  |  **-** |  **--** |  **--** |  **--** |  **E**  |  **.30**  |  **--**  |  **III**

*Used on vertically arranged units. Rails to be 1-1/2 times the unit height.

** Substitute TYPE B isolator for roof installations.

***Substitute TYPE B-2 base for Class 2 & 3 fans.

**DEFL. GUIDE**

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**NOTES:**
1. "ISOL" AND "BASE" COLUMN INDICATES LETTER TYPE AS APPEARS IN THE SPECS.
2. "MTNG" REFER TO METHOD OF SUPPORT OF EQUIPMENT FROM THE STRUCTURE.
3. "SEE GUIDE" INDICATES ISOLATOR DEFLECTION SELECTION TO BE TAKEN FROM RPM/DEFLECTION GUIDE AT BOTTOM OF TABLE.

**2.20 AUTOMATIC TEMPERATURE CONTROLS (DIRECT DIGITAL CONTROL)**

A. Scope

1. Furnish design and installation of Automatic Temperature Controls (hereinafter referred as ATC) to achieve sequence of operation described herein and make the system complete and operable.
   a. The ATC system shall be based on existing campus-wide Johnson Controls (JCI) Metasys Direct Digital Controls (DDC), or approved equal by Honeywell or Invensys ENE.
   b. The ATC system shall be integrated fully to the existing Campus JCI DDC system with equal high-end graphics package, and with fully interfaced BACnet Open Protocol bus. Upgrade from JCI proprietary N2 bust to true open protocol bus shall be as dictated by UMA.
   c. The system shall be an expansion of the existing DDC system, shall be fully tested to the satisfaction of Designer and University before being interfacing to the Campus system using UMA designated WAN network and specific protocols.
   d. This contractor shall be responsible for modification of any and all equipments, controls and components as required making the entire system compatible, complete, and operable.
   e. VAV fume hood (furnished by others) controls as required including all appurtenances, as well as OSHA required continuous monitoring system with ability to override alarm during unoccupied modes.
   f. Assist Commissioning agent as required.
1. Remove from this building, and proper capping of, in its entirety, all existing controls associated with the construction scope area, including but not limited to control panels, pneumatic tubing, remote devices and components, control wiring, EP/PE switches, transducers, and other control appurtenances.

2. All HVAC equipment, without exception, shall be controlled and monitored by DDC system.

3. Air flow monitoring stations shall be selected by DDC sub-subcontractor to be fully compatible with its DDC system, based on capability of Ebtron, or approved equal system by Air Monitor or Yokogawa. When air flow monitoring station is used for fume hood exhaust system, it shall be constructed of 316 SS and/or approved corrosion resistant materials.

4. Furnish all automatic control dampers and air flow measuring devices to be installed by Sheetmetal Sub-sub contractor. All control dampers shall be low leakage type. Fume hood exhaust system control dampers shall be 316SS single blade round damper with 90 or 45 degree full stroke rotation, complete with fast acting (1.5 second full stroke, or as required) and modulating rotary actuator with PID loop controls for accurate response to fume hood sash position changes.

5. Select and furnish all automatic control valves, flow metering devices, flow switches, and sensors to be installed by HVAC subcontractor.

6. Electrical trade provided Fire Alarm system shall shut off respective air handling devices when duct smoke detectors sense smoke in the system. Provide interface with the alarm system to include status report to the DDC system, so that on shut off conditions, the operator explicitly sees on screen that the shut off is due to or not due to fire alarm condition.

7. The ATC subcontractor shall provide all electrical power wiring and control wiring associated with the ATC installation. This shall include all electrical junction boxes, circuit breakers, conduits, relays and related accessories to make a complete and operational system.

8. Existing DDC control panels at existing fume hoods may be re-used and relocated. Provide new control panels, as required.

9. DDC controls for fan coil units and VAV boxes shall be field mounted by this ATC sub-subcontractor.
11. Fan coil unit shall be ordered with condensate drain overflow sensor. ATC shall wire this sensor to stop fan and shut off chilled water coil, and regular alarm status.

12. Static pressure for fan controls and differential pressure sensors for pump controls’ set points are based on conservative estimate. It is responsibility of this sub-subcontractor, in close coordination with TAB sub-subcontractor to field determine lowest possible actual set point for lowest possible energy operations. Such effort, and methodology shall be recorded for designer’s and UMA’s scrutiny.

13. Shop drawing submission shall include the following minimum:
   a. System architecture.
   b. All component cut sheets, with its specific function/use, specific model, and size for each use clearly marked. Performance, range, accuracy and repeatability. Generic cut sheet shall be basis for rejection.
   c. Wiring diagrams.
   d. Example level of high-end graphics.
   e. Complete base schedule, worked out with UMA.
   f. Control diagram for each system, clearly drawn on 11”x17” sheets, with associated sequence of operation. The diagram must indicate physical location of the components (sensors, control valves, adjustment, panels, etc) noted.
   g. Maintain record of components installed, which shall be transferred to record as-built drawings. Each component will be checked off on the as-built drawings for completeness.

B. Sequence of Operations: Refer to drawings for additional information.

1. VAV Fume Hoods:
   a. Full range of sash movement is considered closed position to 18” height (normal limit restricted by the thumb release sash locks). The system is selected for 80 fpm FV based on 18” sash height for maximum flexibility for UMA. New fume hoods for this project is to be provided by others, and projected to have FV requirement between 60-80 fpm with varying VAV profiles. When the fume hoods are selected by the Architect and its technical data made available this designer, new air balancing directive for the spaces having new fume hoods will be issued. It is the responsibility of this sub-subcontractor to review the full fume hood shop drawings and coordinate with air balancing sub-subcontractor to assure proper operation and controls.
   b. Install new 316SS damper and modulating damper actuator, face velocity sensor, face velocity transmitter, air flow monitor and control panel as required to make the hood into variable air volume (VAV) operations. All components used in fume hood exhaust ductwork shall be of 316SS.
   c. As sash moves through its range, damper shall be modulated through PID loop controls to adjust air flow at the selected FV using feedback information received from the air flow monitor. Minimum exhaust air flow through the fume hood shall be set to 20% (adj).
d. Face velocity monitor complying with UMA Standards as well as OSHA 29 CFR part 1910 shall be provided. Audio/visual alarm shall be automatically silenced during unoccupied periods through DDC system.

e. Minimum DDC Points (Provide additional points as required):
   1) Digital Input Points: Occupancy sensors as required, low FV sensor alarm.
   2) Analog Input Points: space temperature sensors as required, set point adjustment input as required, duct SP, fume hood FV readings, fume hood CFM.
   3) Digital Output Points: alarm silencing during unoccupied period operation.
   4) Analog Output Points: ACD modulation.

2. Labs:

   a. Occupancy- At least two occupancy sensors shall be provided for each Lab up to 1,000 SF; additional sensor for each additional 500 SF, with additional fractional quantity required rounded up. When all of the sensors have not detected occupancy for more than 2 hours (adj) between night hours of 6 PM to 7 AM (adj), the space shall be considered fully unoccupied. When all of the sensors have not detected occupancy for more than 2 hours outside the above described night hours (automatically adjusted in response to the night hours adjustment above), space shall be considered day time unoccupied.

   b. Fume hood flow varies between 100% down to 20% (adj) in response to the sash height position selected by occupant. Fume hood flow reduces down to 50% of above rate only when the space is determined to be fully unoccupied.

   c. Fume hood exhaust CFM rate is tracked and Supply air VAV box modulated to maintain constant 100 CFM (adj) space negative pressure.

   d. Occupied Mode- Fan coil unit’s fan operates continuously and hot water or chilled water coil ACV modulated to maintain heating set point of 70F (adj) and cooling set point of 76F (adj). Supply VAV box damper modulates to track fume hood exhaust CFM less 100 CFM of negative pressure. If space temperature rises above set point, indicating given air flow rate is inadequate to maintain cooling set point, supply VAV shall be increased as required to meet the set point, with general exhaust VAV modulating to track the supply CFM rate while maintaining the constant 100 CFM negative value.

   e. Day Hour Unoccupied Mode - same as above. Program so that UMA can select to make the operation same as above except that fume hood exhaust rate to be reduced to 50% (adj). Supply VAV box shall track as required maintaining proper pressurization.

   f. Fully Unoccupied Mode- fume hood flow is reduced to 50% (adj) of the normal ranges, fan coil unit’s fan is cycled and hot water or chilled water coil ACV modulated to maintain heating night setback set point of 55F (adj) and cooling night setback set point of 85F (adj). Supply VAV box shall track as required maintaining proper pressurization.

   g. Minimum DDC Points (Provide additional points as required, refer to fume hood controls above):
      1) Digital Input Points: Occupancy sensors as required.
      2) Analog Input Points: space temperature sensors as required, set point adjustment input as required, SA CFM to space, General EA CFM from the space.
4) Analog Output Points: SA VAV box modulation, SA VAV box HW ACV modulation, EA VAV modulation.

3. General Spaces:
   a. Occupancy- when all of the sensors have not detected occupancy for more than 30 minutes (adj) between night hours of 6 PM to 7 AM (adj), the space shall be considered fully unoccupied. When all of the sensors have not detected occupancy for more than 30 minutes (adj) outside the above described night hours (automatically adjusted in response to the night hours adjustment above), space shall be considered day time unoccupied... spaces having more than one occupancy sensor shall signal occupancy equaling to ratio of the detectors (i.e. if one of two sees occupancy the space will be assumed to be 50% occupied).
   b. Occupied Mode- Fancoil unit’s fan operates continuously and hot water or chilled water coil ACV modulated to maintain heating set point of 70F (adj) and cooling set point of 76F (adj). Supply air VAV box damper modulates to maintain cooling set point between 10% to 100% CFM (final directive shall be provided by designer upon receipt and acceptance of final fume hood shop drawings [furnished by others] ). When temperature drops set point, reheat coil ACV shall modulate to maintain set point. On further drop in temperature, CFM shall be increased up to 50% while modulating hot water ACV to meet the heating set point. General exhaust VAV box is modulated track the supply VAV box CFM.
   c. Day Hour Unoccupied Mode - same as above, except heating set point reduced by 5F (adj) and cooling set point increased by 5F (adj).
   d. Fully Unoccupied Mode- Cooling function shut off. VAV operated to maintain setback set point of 55F (adj).
   e. Minimum DDC Points (Provide additional points as required):
      1) Digital Input Points: Occupancy sensors as required.
      2) Analog Input Points: space temperature sensors as required, set point adjustment input as required.
      4) Analog Output Points: SA VAV box modulation, SA VAV box HW ACV modulation, EA VAV modulation.

C. DDC System:

1. Hardware Requirements:
   a. Connected to the central station in the Physical Plant through JCI’s N2 network on UMA fiber optics backbone, through means specified by Owner. Comply with UMA’s directive to upgrade the N2 bus to an industry standard bonafide open protocol bus.
   b. Provide an interface connection for owner’s laptop PC to plug in to interface with the building’s DDC system within the building for local servicing.
   c. Air flow sensors for the exhaust ductwork shall be Ebtron gold series with optional 316 SS tube and all wetted parts being corrosion resistant design for use in fume hood exhaust applications. Provide matching transmitter for interface with selected DDC system. Air flow reading accuracy shall be within 2% and repeatability shall be within 0.25% for air flow velocity.
between 0 to 5,000 fpm. Integral temperature sensor shall have accuracy of 0.5°F and shall continuously compensate for air temperature conditions. It is responsibility of this contractor to select the sensor to achieve the required control ranges.

d. Fume hood velocity controller shall be solid state electronic model specifically designed for such use. The sensor and transmitter shall be capable and set up to maintain face velocity through control damper modulation and shall be capable of stabilizing flow within 3 seconds of sash movement. When fume hood sash is fully closed, minimum flow rate shall be maintained. Air sensor accuracy shall be within 5% and repeatability shall be within 1% for air flow velocity between 0 to 150 fpm. Integral temperature sensor shall have accuracy of 0.5°F and shall continuously compensate for air temperature conditions.

2. Software Requirements: full high end graphics package consistent with the campus DDC system and meeting with the Owner’s satisfaction.

3. Provide freeze protection sensors, shut off function and high level alarm for all systems and spaces.

2.29 ACCESS DOORS

A. Provide proper access to materials and equipment that require inspection, replacement, repair or service and coordinate their delivery with the installing Trade. If proper access cannot be provided, confer with Designer as to best method of approach for minimizing effect of reduced access which may result.

B. Coordinate and prepare a location, size, and function schedule of access panels required to fully service equipment and deliver to a representative of the installing Trade. Furnish and install distinctively colored buttons (color as selected by Designer) in finished ceiling to identify all access panels.

C. Furnish access panels for installation under other Sections where fire dampers, volume dampers, controls, shut off valves, control valves, check valves, or other items installed under this Section require access and are concealed in floor, wall, furred space or above ceiling.

D. Ceilings consisting of lay in or removable splined tiles do not require access panels and dampers, splitters, or test hole openings above ceiling shall have location marked with thumb tack on finished ceiling panel. Location shall be noted on record drawings.

E. Furnish access doors and frames for walls and ceilings to applicable trades for installation. Size as required for access and maintenance, minimum 16 by 16 inches.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

4. Milcor Inc.
5. Nystrom, Inc.

   1. Locations: Wall and ceiling surfaces as applicable.
   2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
   3. Frame: Minimum 0.060-inch-thick sheet metal with suitable bead flange.
   4. Hinges: Continuous piano.
   5. Lock: Cylinder, keyed alike.

   1. Locations: Wall and ceiling surfaces as applicable.
   2. Fire-Resistance Rating: Not less than that of adjacent construction.
   3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
   4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
   5. Frame: Minimum 0.060-inch thick sheet metal with suitable bead flange.
   6. Hinges: Continuous piano.
   8. Lock: Self-latching device with cylinder lock, keyed alike.

PART 3 - EXECUTION

3.1 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. The Designer will check the completed installation either sequentially as different parts are completed, or when the entire installation is complete, at the sole option of the Designer.

B. Prior to the Designer’s checking a part of the installation or the entire installation, this contractor shall submit a letter signed by an officer of this contracting company or an officer of the Construction Manager stating that:
   1. he is an officer of the company,
   2. he has personally inspected the installation to be checked,
   3. the date of his inspection,
   4. the installation is complete and tested and ready to be inspected by the Designer, and that all required test reports have been submitted.

C. This contractor shall arrange that an officer of this contracting company or of the Construction Manager, as well as UMA’s Project Manager, in addition to other test witnesses that may be specified, shall witness the below listed tests. At the conclusion of each such test this contractor shall submit a letter signed by the officer stating that:
   1. he is an officer of the company,
   2. he has personally witnessed the test (give the name of the test),
   3. the date of testing,
4. the results of testing, as compared to specified performance,
5. listing the name, title, and company affiliation of all those witnessing the test.

3.2 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections.
5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Designer.
6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor mounted vibrating and rotating equipment provided under this Section.
7. Notify Designer of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Designer, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non-functioning and abandoned piping, ductwork and equipment as directed by Designer. Dispose of or store items as requested by Designer.

B. Installation Only Items

1. Where this contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for their unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:
   a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
   b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
2. This contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this contractor will be considered only if presented in writing within one week of their date of delivery. Unless such claims
have been submitted this contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.

C. Maintenance of equipment and systems: Maintain HVAC equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.

D. Use of premises: Use of premises shall be restricted as directed by Designer and as required below.

1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Designer and as specified under CLEANING paragraph.

2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.

3. Do not interfere with function of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Designer as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Designer to provide minimal interference with normal operation. Obtain Designer's approval of the method proposed for minimizing service interruption.

E. Surveys and measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.

2. In event of discrepancy between actual measurements and those indicated, notify Designer in writing and do not proceed with work until written instructions have been issued by Designer.

F. Fireproofing:

1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible, prior to start of spray fiber work.

2. Ducts, piping and other items which would interfere with proper application of fireproofing shall be installed after completion of spray fiber work.

3. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to UMA.

G. Temporary Heat:
Morrill I and IV North
1st and 3rd Floor Microbiology Consolidation
Project #: 1007439
UMA#: 17-10

HEATING, VENTILATING AND AIR CONDITIONING

1. Special reference is made to Section 015000, TEMPORARY FACILITIES AND CONTROLS.
2. Coordinate work under this Section with progress of construction so that permanent heating system will be ready to provide temporary heating if permitted by Designer as soon as building is closed in.
3. Provide and direct labor required for attendance, operation and final restoration of permanent heating system if used for temporary heating purposes. Continuous direct attendance shall be provided whenever permanent system is in operation prior to acceptance of permanent heating system by UMA’s Project Manager.

H. Gypsum Drywall Enclosures:
   1. Coordinate and supervise construction of drywall and related work affecting work of this Section.
   2. Work shall include but not be limited to following:
      a. Supply and return air duct enclosures on rooftop air handling units.
      b. Supply air plenums located above labs and computer rooms.
      c. Return air shafts.
   3. Ensure tightness of plenums and chases used as part of air distribution system. System will not be accepted until proved tight, without leakage. Notify Designer in writing after system test for leakage, if construction and finish of plenums and ducts are not satisfactory.

I. Airbound Coils
   1. If, after plant is in operation, any coils or other apparatus are stratified or air bound (by vacuum or pressure), they shall be repiped with new approved and necessary fittings, air vents, or vacuum breakers at no extra cost. If connections are concealed in furring, floors, or ceilings, this trade shall bear all expenses of tearing up and refinishing construction and finish, leaving same in as good condition as before it was disturbed.

3.3 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear. Ductwork and piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe and duct openings shall be temporarily closed to prevent obstruction and damage before completion.

B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.

C. References to manufacturers and to catalog designation, are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.
D. Finish of materials, components and equipment shall be as approved by Designer and shall be resistant to corrosion and weather as necessary.

E. UMA will not be responsible for material and equipment before testing and acceptance.

3.4 CONTINUITY OF SERVICES

A. Do not interrupt existing services without the UMA Project Manager’s approval.

B. Schedule interruptions in advance, according to the UMA Project Manager’s instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.

C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on the User Agency’s operations.

3.5 TAGS

A. Upon completion of work, attach engraved laminated tags to all valves (listed in the valve directory called for in the "Bulletins, Manuals and Instructions" paragraph of these specifications) and all pieces of HVAC equipment (including but not limited to pumps, fans, air handlers, coils and all other equipment listed in the HVAC schedules). Valve tags shall have black characters on white face, consecutively numbered and prefixed by letter "V". Equipment tags shall have black characters on white face, with labels corresponding to drawing schedule numbers.

B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8" thick.

C. Valve tags shall be at least 1" in diameter with numerals at least 3/8" high and attached by "S" hooks or chains. Equipment tags shall be at least 2" diameter securely attached to apparatus.

D. Provide manufacturers equipment nameplates, catalog numbers and rating identification securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

3.6 PIPE AND DUCT IDENTIFICATION

A. Ductwork shall be stenciled at each junction or branch takeoff, at least once in each room, and at intervals not longer than 20 ft. Stencil shall clearly identify duct service (S for supply, R for return, X for exhaust), area served by branch, and arrow indicating direction of flow.

B. Provide color coded pipe identification markers on piping installed under this Section. Pipe markers shall be snap on laminated plastic protected by clear acrylic coating. Pipe markers shall be applied after architectural painting where such is required.

C. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double headed arrow marker.
D. Mains shall be labeled at points of entrance and exit from mechanical room, adjacent to each valve, on each riser, at each tee fitting, at points of entrance and exit from building, at least once in each room, and at intervals no longer than 20 ft.

E. Size of legend letters on markers and length of color field shall be per the latest edition of ANSI A13.1.

F. Markers shall be "Setmark" by Seton Name Plate Corp. or approved equal.

G. Following color coding shall be used with names in black letters on background and white letters on green background.

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<th>Service</th>
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<td>Low pressure steam</td>
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<td>Yellow</td>
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<tr>
<td>Medium pressure steam</td>
<td>MPS</td>
<td>Yellow</td>
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H. Color banding shall meet latest edition of ANSI A13.1 and OSHA.

3.7 WELDING

A. Weld only by approved acetylene or electric welding processes and welders shall hold certificate from approved insurance company.

B. Conduct test to demonstrate suitability of procedures to be used in making welds which conform to specified requirements.


D. Align components. No strain shall be placed on weld during welding. No part of pipe shall be offset more than 20% of thickness. Set flanges and branches properly.

E. Welder Qualification:

1. Test welders to demonstrate ability to make acceptable welds. Tests conducted for qualification of welder for work under one Division or Section shall not qualify welder for work under another Division or Section.
2. Tests shall be as prescribed for welder qualification in Section IX of the ASME code.
3. Records of such tests shall be as follows: Each welder shall be assigned an identifying number, letter or symbol. Identifying mark shall be stamped adjacent to welds made by
this welder. Identification shall be at top of horizontal piping and at front of vertical piping.

4. Maintain record of welders employed, showing dates and results of tests and identifying mark assigned to each welder. Certify records and make them accessible to the UMA Project Manager. Before completion of project, one copy of records shall be turned over to UMA.

5. No qualification shall be older than three years when welder commences work on this project. If welder has not welded in required welding process for a period of six months, he shall be re certified.

F. Welding Tests

1. As designated by Designer, remove welds for destructive testing or for testing by non-destructive means. Tests shall be as determined by Designer.

2. If, in Designer’s opinion, welds so tested do not meet requirements of Sections VIII and IX of ASME, remove welds welded by that welder, at no cost to UMA. Rewelding shall be performed by qualified welder other than welder whose welds did not pass test. Welders whose welds were defective shall not be employed on site for remainder of project.

3. Welding of stanchions, brackets, anchors and other welding not performed on pipe joints shall be in accordance with requirements of AWS specifications and requirements.

3.8 PENETRATIONS AND SLEEVES

A. General

1. Provide pipe and duct sleeves and packing materials as specified and as shown on Drawings at penetrations of foundations, walls, slabs (except on grade), partitions and floors. Sleeves shall meet NFPA 101 requirements and materials requirements of Part 2 of this Section.

2. Coordinate work carefully with architectural and structural work. Set sleeves in forms before concrete is poured. Provide core drilling as necessary if walls are poured, or otherwise constructed, without sleeves and a wall penetration is required. Provide core drilling as required for penetrations of existing construction. Do not penetrate structural members without Designer’s approval.

3. Sleeves for insulated pipe and duct in non fire rated construction shall accommodate continuous insulation without compression. Sleeves and/or penetrations in fire rated construction shall be packed with fire rated material which shall maintain the fire rating of the wall. Seal ends of penetrations to provide continuous vapor barrier where insulation is interrupted. See Part Two of these specifications for requirements for packing materials.

4. Sleeves through floors shall be water tight and shall extend 2" above floor surface.

B. Pipe Sleeves

1. Annular space between pipe and sleeve shall be at least 1/4".

2. Sleeves are not required for slabs on grade unless specified otherwise.
3. Sleeves and packing materials, through rated fire walls and smoke partitions shall maintain fire rating of construction penetrated.
4. Do not support piping risers on sleeves.

C. Duct Sleeves and Prepared Openings

1. Provide duct sleeves for round ducts 15" and smaller; provide prepared, framed openings for round ducts larger than 15" and for square, rectangular and flat oval ducts, except as specified otherwise. Sleeves shall meet SMACNA requirements.
2. Provide sleeves for ducts through 1, 2 or 3 hour fire rated construction and smoke partitions, regardless of size and shape of ducts. Sleeves shall maintain fire rating of construction penetrated. Sleeve and seal materials, construction and clearances shall meet requirements of SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems.
3. Prepared openings shall be framed to provide 1" clearance between framing and duct or duct insulation.

D. Installation Testing, Listings and Approvals

1. Installation shall meet material manufacturer's recommendations exactly, particularly as regards safety, ventilation, removal of foreign materials and other details of installation. Dam openings as recommended. Remove flammable materials used for damming and forming seals in fire rated construction.
2. Sleeve penetration methods shall be water and gas tight and shall meet requirements of ASTM E 119 Standard Methods of Fire Tests of Building Construction and Materials.
3. Fire stop penetration seal methods and materials shall be FM approved and UL listed as applicable.
4. Inspect foamed sealants to ensure manufacturer's optimum cell structure and color ranges.

3.9 ANCHORS AND INSERTS

A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachment of equipment supports and hangars.

3.10 INSTALLATION OF EQUIPMENT

A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Designer and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.
C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Designer, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.11 PAINTING

A. Equipment installed under this Section shall have shop coat of non lead gray paint. Hangers and supports shall have one coat of non lead red primer. Machinery such as pumps, fans, etc., shall be stenciled with equipment name. Stencil shall be at least 6" high for large equipment, 2" high for small equipment. Finish painting, including painting of various piping and duct systems, shall be done under other Sections.

B. Note requirement for Designer’s approval invoked under Part 3 article, MATERIALS AND WORKMANSHIP regarding finish of material and equipment which are visible or subject to corrosive or atmospheric conditions.

3.12 EXPANSION PROVISIONS

A. Installation of piping must allow for expansion using offsets, loops, swing joints, expansion joints, etc. as shown and as necessary to prevent undue strain. Take offs from mains to runouts shall not have less than three elbow swing.

B. Mains and risers with loops or offsets shall be securely anchored to structure so as to impart expansion towards loops or offsets. Anchors shall be constructed of heavy forged wrought iron, secured to pipe and to structure. Provide vibration isolation as required.

C. Provide pipe alignment guides as required to guide expanding pipe to move freely from anchor points toward expansion joints, offsets, etc.

3.13 CLEANING

A. Ductwork

1. Ducts shall be thoroughly cleaned so that no dirt or dust shall be discharged from diffusers, registers or grilles, when system is operated.
2. Provide temporary connections required for cleaning. Provide cheesecloth for openings during cleaning.
3. Replace filters prior to final inspection and testing.

B. Piping
   1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
   2. Permanently install necessary chemical injection fittings complete with stop valves.
   3. After chilled water, heating hot water, condenser water, steam and condensate piping have been pressure tested and approved for tightness, clean and flush piping specified under WATER TREATMENT Paragraph.
   4. Maintain continuous blowdown and make up, as required during flushing operation.

C. Equipment
   1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.14 STARTUP, TESTING AND BALANCING (Filed Sub-Sub-Bid Required)

A. General
   1. Provide qualified personnel, equipment, apparatus and services for start up, testing and balancing of mechanical systems, to performance data shown in schedules, as specified, and as required by codes, standards, regulations and authorities having jurisdiction including City Inspectors, UMA’s Project Manager and Designer. Note that some ATC start up procedures listed below require the cooperation of the balancing contractor and the rooftop unit manufacturer's representative (if rooftop units are involved) and some balancing procedures require the cooperation of the ATC contractor and the rooftop units manufacturer representative (if appropriate). Ensure that all contractors are present on site during the entire time that these procedures take place. Note that some procedures listed below have a distinct order of precedence, e.g., the testing of the temperature control system shall not occur until major pieces of mechanical equipment have been started up and testing is complete. Ensure that any listed orders of precedence for procedures are followed.
   2. Startup, testing and balancing shall not diminish guarantee requirements.
   3. Notify Designer and authorities involved at least two weeks before startup testing and balancing begins.
   4. Before temperature control testing begins a meeting shall be held between the HVAC engineer, the balancing contractor, the automatic temperature control contractor and the mechanical contractor. The mechanical contractor shall present the HVAC engineer with the completed checklists (contained in this specification) certifying that equipment startup and testing has been completed. The temperature control contractor shall then present his procedures for testing the ATC system to the HVAC engineer for review and approval. Allow one full day for this meeting.
   5. When the temperature control testing has been completed a second meeting shall be held. At this time the temperature control contractor shall present the HVAC engineer with the
completed controls startup checklist (contained in this specification). The balancing contractor shall present HVAC engineer with certificates of calibration for balancing instruments, proposed balancing forms and proposed balancing procedures to the HVAC engineer, for review and approval. Allow one full day for this meeting.

6. If, through no fault of the Designer, the above two meetings do not take place and the temperature control startup and balancing proceeds the following shall occur.
   a. All balancing reports shall be rejected.
   b. The contractors requisition for monies covering the ENTIRE portion of the testing and balancing work will be rejected. Others will be hired to complete the work. These requirements shall be strictly enforced.

7. Do not cover or conceal work before testing and inspection and obtaining approval.

8. Instruments for testing and balancing shall have been calibrated within one month prior to testing and balancing. Calibration shall be traceable to NBS Standards. Provide Photostat of certificate of calibration to Designer’s representative at meeting demonstrating balancing procedures mentioned in Paragraph 4 above.

9. Leaks, damage and defects discovered or resulting from startup, testing and balancing shall be repaired or replaced to like new condition with acceptable materials. Tests shall be continued until system operates without adjustments or repairs.

10. Report on reporting forms, submitted to Designer for approval in advance, and on forms provided by Designer.

11. For each piece of equipment, copy nameplate data and include in report.

12. Submit six copies of testing and balancing reports to Designer for approval.

13. Provide capacity and performance of equipment by field testing. Install equipment and instruments required for testing, thermo wells and gauge connections at no additional cost to UMA.

14. Qualified representative of equipment manufacturer shall be present at test.

15. Startup, testing and balancing procedures outlined below are the minimum effort required for the project. Contractor shall use any additional procedures he feels will be necessary to properly startup, test and balance the job.

B. Automatic Temperature Controls Testing

1. Temperature Control Testing General Requirements
   a. Start up temperature control system so that all sequences of operation called for in Designer’s drawings and specifications operate properly. Ensure that all control components are properly calibrated in accordance with manufacturer’s instructions. See that all software, included with control system, is fully debugged. For further requirements see automatic temperature control paragraph of these specifications. For requirements requiring letters certifying ATC startup see paragraph 3.1 of these specifications.

2. Temperature Control Testing General Requirements
   a. Test Temperature Control System after all major pieces of mechanical equipment have been started up, as described above, have been completed and after all tests described in the EQUIPMENT TESTING Paragraph (and elsewhere in Part 2) have been completed. Note portions of ATC test procedures below which require cooperation of balancing contractor. Ensure that balancing contractor is present during entire time when these test procedures take place.
b. Where it is said below to confirm or ensure the operation of a particular piece of control equipment, this means to confirm that operation is as called for in the Control Sequence of Operation which are shown on the HVAC drawings or listed in the HVAC specifications. If operation is not as called for by sequences, make any necessary corrective actions so that controls perform as required on Contract Documents. On completion of ATC testing, fill out, sign and return to Designer, the checklist included in this Specification.

c. Perform any additional checkout test required by manufacturer for proper system operation whether or not listed below. If any checkout test below conflicts with a particular manufacturer's recommendation bring matter to the attention of Designer immediately.

d. Where it is stated below to verify pneumatic output to a valve verification shall be done by pressure gauge at E/P transducer controlling valve and by visual confirmation that pneumatic tubing at valve diaphragm is in place. Where it is said to visually confirm damper position it means go to location in the field, open access door and note position of damper blades. If access door does not exist, notify Designer and Construction Manager immediately. EXCEPTION: Do not open air handler casing when fans are on. Note position of AHU dampers, located within AHU casing, by observing operator position. Readings of pneumatic output at CRT, portable terminal or damper position verification by means of feedback potentiometer may be made in addition to but not instead of above measures.

e. Where reference is made below to confirming or ensuring operation of a particular item, it shall mean all items of that type, not a representative sample.

f. Where it is said below to simulate the operation of a particular cycle for DDC systems, actual control signal inputs at the time of the test shall be temporarily overridden in software and test values substituted. For example to simulate an economizer switchover temperature of 70°F outside temperature with the actual outdoor air input at the DDCFP is 45°F, temporarily substitute 70°F for 45°F in software, perform the test then switch back to the actual input when the simulation is complete.

g. Where it is said below to simulate the operation of a particular cycle for pneumatic systems, pneumatic inputs shall be applied to controllers, which correspond to actual conditions to be simulated. For example, to simulate an economizer switchover of 70°F, determine the pneumatic output pressure from the outdoor air temperature transmitter which corresponds to 70°F, temporarily disconnect and cap the transmitter line and replace it with a pneumatic line fed through a manually adjustable pressure reducing valve. Using a calibrated pressure gauge, in the output line from the PRV, adjust the PRV to produce the pneumatic output to the controller corresponding to 70°F. Perform the test, then replace the transmitter line to the controller.

h. Temperature control testing shall not be performed until all pneumatic components have been calibrated in strict accordance with manufacturer’s instructions. This includes, but is not limited to receiver controllers, temperature transmitters thermostats, transducers, relays and logic networks. Temperature measurements during the calibration process shall be made with an electronic thermometer accurate to 0.25°F.

i. Where testing requirements below mention air handling units, this shall mean the fan sections of rooftop units if rooftop units are on the job.
3. Temperature Control Start Up Tests
   a. With the air handlers supply fan turned off at the motor starter, perform the following tests: (Contractor shall ENSURE that electric power to air handler is OFF).
      1) Visually inspect all fans interlocked with the supply fan to ensure that they are off.
      2) For VAV units, with the disconnect at the supply fan locked in the off position, open the air handler casing and ensure that the inlet vanes are fully closed.
      3) Visually inspect all control dampers and ensure that they are in positions that the control sequences call for them to be when the fan is off. Particularly ensure that the outdoor air damper is fully closed.
      4) Note pneumatic outputs to all control valves, and ensure that the valves are in position that the control sequence require them to be when the fan is off. For example, if a normally open valve is supposed to be closed when the fan is off, and the valve actuator has a three to 15 psig spring range, ensure that at least 15 psig is output to the actuator.
      5) For DDC system confirm by checking CRT that fan status i.e. that fan is off.
   b. Ensure that all personnel and tools are out of air handler casing, ensure that casing is closed and locked; put any disconnect other than those at starter to the on position. Then have fan started at motor starter and perform the following procedures.
      1) For units which are not supposed to start until smoke or outdoor air dampers are proven fully open via limit switches visually observe the damper operators and limit switches when the signal is given to start the fan and ensure that the fan does not start until contact with the limit switch is made.
      2) For VAV systems, note pneumatic output to inlet vane operator, ensure that ramp time to vanes fully opening is within tolerance called for by control sequences of operation. For example if a two minute ramp time is called for before vanes fully open, ensure that output to vane operators does not go from minimum to maximum in less than two minutes.
      3) Ensure that fans interlocked to air handler supply fan run after AHU fan starts. Visually observe each fan.
      4) Adjust freezestat setpoint upwards until freezestat trips confirm stat has tripped with continuity tester. Ensure that fan stops and dampers and valves go to positions outlined in control sequences under "freezestats". Particularly ensure that outdoor air damper is fully closed and heating coil valve is fully open. After test, set freezestat setpoint to design, press manual reset button and confirm that fan restarts. For DDC system ensure that freezestat alarm condition is reported at CRT and line printer when freezestat is activated.
      5) With balancing contractor present, test static pressure low and high limit switches as follows: Connect pneumatic tubing to high or low port of limit switch (depending on whether switch is to trip on low or high pressure) connect via a tee, the same pneumatic line to manometer. For a high pressure switch connect tubing to manometer port used for measuring positive static pressure. For a low pressure switch connect tubing to port used for measuring negative static pressure. Slowly blow into tubing and
observe manometer. Ensure that switch trips and fan shuts down at pressure called for by control sequence. Confirm that switch has tripped with continuity tester. After test remove test tubing and press manual reset button ensure that fan restarts. For DDC systems ensure that correct alarm message registers at CRT and line printer when switch trips.

6) For DDC systems ensure correct status signal registers at CRT and line printer when fan is on.

7) For DDC system with differential pressure switches across filter bank repeat procedure used to test limit switches and ensure switch trips at correct setpoint. Confirm switch has tripped with continuity tester only (fan should not stop). Confirm dirty filter alarm registers at CRT and printer when switch has tripped.

8) To test units with dry bulb economizer cycles do the following: Simulate outdoor temperature greater than economizer switchover temperature. Ensure that outdoor air damper is in minimum position (or variable outdoor air damper is fully closed if minimum damper is called for in the control sequences). Change discharge air setpoint downwards confirm cooling coil valve (if chilled water) modulates open. Change discharge setpoint upwards confirm cooling coil valve modulates closed. Simulate outdoor air temperature below economizer switchover setpoint above discharge air setpoint. Ensure that outdoor air damper (or variable outdoor air damper) fully opens. Change discharge setpoints and ensure cooling coil valve modulates properly. Simulate at least three outdoor air temperature below discharge air setpoint. Ensure that cooling coil valve is closed and that as simulated outdoor temperature is reduced the outdoor air damper and relief damper modulate closed, while the return damper modulates open.

9) For all units with face and bypass dampers, simulate an outdoor temperature of 40°F or below. Note pneumatic output to heating valve to confirm that it is fully open. Note pneumatic output to face and bypass dampers to confirm they are modulating and visually note operator damper positions (i.e., change discharge setpoint and see if output to dampers change). Simulate outdoor air temperature of 42°F or above. Confirm by noting pneumatic output and visually that face damper is fully open, bypass damper is closed. Note that coil valve is modulating (i.e., change discharge setpoint and note variation in pneumatic output).

10) For VAV units have balancing contractor measure static pressure at differential pressure transmitter location with manometer. Ensure that pneumatic input to receiver controller, which controls supply fan inlet vanes, or for DDC systems, duct static pressure reading at CRT, agrees with manometer reading. Change setpoint of transmitter minimum of four times and ensure that input at receiver controller or reading at CRT agrees with manometer reading over range of reading. Ensure that when transmitter setpoint is raised inlet vanes of supply fans modulate open and when transmitter setpoint is lowered inlet vanes modulate closed. Recalibrate transmitter as required. If multiple transmitters are used repeat above procedures for all transmitters. Ensure by measuring pneumatic inputs to selector relay and outputs to receiver controller that supply fan inlet vane position is controlled by lowest reading transmitter. For DDC system
ensure that discriminator function in DDC software is functional and supply fan inlet vanes are governed by lowest reading transducer.

11) Confirm that toilet and other exhaust fans start and stop properly via time clock or time clock function in DDC systems.

12) Verify, for DDC systems, that differential pressure switches across pumps give correct pump status when pumps are on or off.

13) For DDC systems confirm alarm setpoints of all alarms listed in sequence of operation in DDC software. Confirm that adequate differentials exist for all alarms to prevent nuisance trapping. Confirm that all field sensors are properly in place and wired to DDCFP.

14) For DDC VAV systems with volumetric controls confirm that velocity pressure transducers are piped correctly to flow measuring stations in both supply and return ductwork. Balancer shall measure supply and return air flows with manometer (take velocity pressure reading convert to velocity than multiply by duct area to get cfm). ATC contractor shall adjust pneumatic output to return fan inlet vane operator to maintain cfm differential with supply. ATC contractor shall simulate changed input from duct mounted static pressure transducer and shall note that supply and return fan inlet vanes modulate appropriately. Balancer shall repeat measurements at flow measuring stations, ATC contractor shall adjust output to return fan inlet vanes. Above procedure shall be repeated as often as necessary to maintain constant cfm differential between supply and return fans between 30% and 100% of maximum flow.

15) At time clock or DDCFP initiate warm-up cycle; ensure ALL control components operate as called for in control sequence of operation.

16) At time clock or DDCFP initiate occupied cycle; ensure ALL control components operate as called for in control sequence of operation.

17) At time clock or DDCFP initiate unoccupied cycle; ensure ALL control components operate as called for in control sequence of operation.

18) For DDC systems test and debug ALL software procedures whether or not listed above.

19) Perform any other tests necessary to verify proper system operation in addition to those listed above.

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<tr>
<th>System No.</th>
<th>ATC Cycle</th>
<th>Date Confirmed</th>
<th>ATC Representative Name and Signature</th>
<th>Construction Manager Representative Name and Signature</th>
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C. Equipment and Piping Testing

1. Tests: No tests shall be started until systems have been cleaned as described under CLEANING Paragraph. Provide temporary piping and connections for testing, flushing or draining systems to be tested. If leaks develop, repairs shall be made and tests repeated. Tests shall be continued until systems operate without adjustments and repair to equipment or piping. Tests are further specified under other paragraphs of this Section.

2. Circulating Water Pumps, Chillers and Fans
   a. Take field measurements on vibration and alignment of pumps, chillers and fans driven by motors over 10 hp. Readings shall include:
      1) Shaft alignment
      2) Equipment vibration
      3) Bearing housing vibration
      4) Foundation vibration
      5) Building structure vibration
      6) Readings directed by Designer
      7) Maximum vibration at any point listed shall not exceed 2 mils.
   b. Refrigeration Systems
      1) Test water chilling unit and other refrigeration systems for refrigerant and air leaks at least twice: Approximately six months after start up and at end of guarantee period.
      2) Use electronic refrigerant detector for leak detection.
      3) Leaks detected shall be properly sealed and above test repeated.
      4) Test pressures shall be 300 psi for high pressure side and 150 psi for low pressure side.
      5) Replace refrigerant and oil lost during guarantee period at no cost to UMA.
      6) Certify condition of system in writing after test.
   c. Hydrostatic Test of Piping
      1) Conduct hydrostatic leak tests in accordance with ANSI B31.3, Power Piping Code.
      2) Testing medium shall be water at ambient temperature.
      3) When designated test pressure is applied, connections shall be inspected by Designer ’s representative for acceptance.
      4) Leaks discovered during testing shall be repaired at no cost to UMA; retest system.
      5) Isolate system piping from system components during test.
      6) If any thermostatic traps are present, isolate and remove them before and during testing.
      7) Before test, piping shall be cleaned and flushed as required under CLEANING Paragraph.
      8) After testing, stuffing boxes and valves shall be repacked as directed by Engineer.
      9) Test pressurized piping system to 150% of design operating pressure, no more than 500 psi and no less than 125 psi.

3. When testing is complete fill in the following checklist certifying satisfactory completion of testing. Make multiple copies of checklist as required, edit out items which are not appropriate.
EQUIPMENT AND PIPING TESTING CHECKLIST

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<th>TEST ITEM</th>
<th>DATE CONFIRMED</th>
<th>MANUFACTURERS REPRESENTATIVE NAME AND SIGNATURE</th>
<th>CONSTRUCTION MANAGERS REPRESENTATIVE NAME AND SIGNATURE</th>
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VIBRATION AND ALIGNMENT

FANS

HYDROSTATIC TESTS OF PIPING

D. Air and Water Balancing

1. General
   a. Provide qualified personnel, equipment and services for balancing and adjusting of mechanical systems. Submit resumes at demonstration of balancing meeting.
   b. Personnel shall be experienced and qualified to perform, record, and evaluate all procedures contained here and/or as outlined on drawings.
   c. For each air handler on job, provide, under the work of the mechanical section, one spare sheave of size to be determined after traverses are complete.
   d. Submit procedures, recording forms, and test equipment for review prior to balancing, as described in Paragraph A.4 above.
      1) Balancing procedure or sequence is contained herein.
      2) Recording forms used for balancing must be submitted to Designer for approval before balancing is started.
         a) Failure to submit forms will result in rejection of entire submittal.
         b) Submit description of balancing equipment being used.
      3) Balancing shall not begin until system has been installed complete and capable of normal operation.
         a) All grilles, dampers, fans, coils, pumps, valves and linkages shall be installed and operating prior to balancing.
         b) System shall be capable of operating under control as specified on drawings and/or contained herein.
      4) Independent balancing agency shall have the following qualifications:
a) Agency is known to have specialized in balancing commercial HVAC system for at least 3 years.
b) Agency shall provide proof of qualifications to Designer’s satisfaction. Qualification shall include submitted at least three sample balancing reports prepared for commercial HVAC system over 100,000 ft² in floor area.
c) Agency employed balancing technicians shall be qualified to balance HVAC system to Designer’s satisfaction. Submit resume of technician.
d) At least one balancing technician shall remain on from start to acceptance of final balance report.
e) Agency shall be approved by Designer.
f) Balancing shall be performed by one of the following agencies:
   - Airflow Associates
   - E. Barrett
   - John Coffey and Associates
   - Leonhardt
   - Scott TBA Inc. (Manchester, NH)
   - Wings Air Balance (Brandford, CT)

2. Air System Balancing
a. Testing agency shall balance, adjust and test motors, systems, air moving equipment and distribution, supply, return and exhaust systems, as follows:
   1) Adjust blower rpm to design requirements and record. Test and record motor full load amperes.
   2) Make pitot tube traverse of main supply, return and exhaust and obtain design cfm at fans.
   3) Test and record system static pressure, suction and discharge.
   4) Test and record entering air temperatures.
   5) Balance and adjust supply air systems in finished areas of building:
      a) Balance and adjust as required to deliver volume of air at each air outlet within 10% of design flow shown on Drawings.
      b) Readjust air volumes after occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.
   6) Balance supply air systems in unfinished areas:
      a) Supply air systems shall be balanced after installation of items related to same systems with exception of duct taps to air diffusers in interior zones.
      b) Balance as required to deliver air volume at outlets within 10% of design flow shown on Drawings.
      c) Provide sufficient temporary openings in interior zone duct systems to adjust interior zone air volumes.
      d) Readjust air volumes after completion and occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.
   7) Adjust toilet exhaust and relief air systems as required to deliver air volumes at inlets within 10% of design flow.
   8) Adjust miscellaneous ventilation systems as required to deliver air volumes at inlets and outlets within 10% of design flow.
b. Compile test data and submit to Designer for approval.

c. If questions arise, tests or portions of tests shall be repeated in presence of Designer.

3. Air System Balancing:

   a. Visually inspect all fire, smoke and volume dampers on branch take offs to each floor to ensure that they are fully open.

   b. Verify with straight edge that fan and motor shafts are parallel and that sheaves are in proper alignment. Use Browning belt tensioner to confirm belts are at proper tension. Refer to deflection tables appropriate for installed belts.

   c. Start fans, verify that fan rotation is correct. If not, coordinate with electrical contractor to switch power leads such that the fan rotates correctly.

   d. Verify that fan belts are tight on one side and have slight bow on other side when fan is operating with no excessive squeal at startup. If not correct, adjust sheaves or motor base accordingly.

   e. Check nameplate voltage on motor, compare to scheduled voltage. Notify Designer immediately of any discrepancies. Measure and record actual voltage across all power leads. Notify Designer of discrepancies immediately.

   f. For each variable volume air handling unit do the following:

      1) Add total cfm of all volume boxes shown on approved shop drawings.

      2) Divide this total by the maximum cfm scheduled for the unit to get diversity factor. For example, if total box cfm is 50,000 and AHU is scheduled for 40,000 cfm diversity is 40,000/50,0000 = 80%.

      3) Open (by setting local stats to call for maximum cooling) number of volume boxes necessary to approximate diversity, i.e., in the above example, open 80% of the volume boxes.

   g. Check motor nameplates full load amps, measure and record amperage across all power leads. If there are marked discrepancies in amperage draws between legs, notify Designer immediately.

   h. Measure and record fan and motor rpm. Check that motor rpm agrees with nameplate and scheduled rpm.

   i. Perform static pressure profile as follows: Record all results and submit to Designer.

      1) Determine static pressure across supply and return fans as follows:

         a) Measure static or total pressure at fan suction.

         b) Measure static pressure at fan discharge.

         c) Differential is total static pressure developed by fan.

      2) Determine static pressure:

         a) In discharge ductwork after AHU smoke damper.

         b) Across each filter section.

         c) Across each coil.

         d) Across fire and volume dampers at branch take offs to each floor.

         e) At up to 25 points, in system shown on drawings or to be selected by Designer to be determined when ductwork shop drawings are approved.

      3) Determine the correct causes of any excessively high readings, i.e. open throttled dampers, clean dirty coils, etc. Cover all holes when measurements are complete.
j. Add 1/2" of static pressure to the system, to simulate the effect of dirty filters. Static may be added by throttling branch volume dampers, blanking off portions of the filter section, covering filter section with cheesecloth or other suitable means. Confirm 1/2" static has been added with new static pressure reading across fan. Open dampers, remove cheesecloth, etc. after traverses are complete.

k. Perform pitot tube traverse of supply ducts downstream from AHU discharges and return ducts. Summing CFM totals from diffusers is not an acceptable method of determining total airflow from AHU’s. At Designer’s request, show Designer holes where traverses were taken. Perform traverses in accordance with procedures outlined in latest edition of the SMACNA HVAC Testing. Adjusting and Balancing Manual, except that if recommended lengths of straight duct before and after traverse points are not available, increase number of measuring points by 50%. If a 24 point traverse would be called for given the duct cross section area measure 36 points, for example.

l. Measure amperage at each power leg after traverse is complete. If an overload condition exists with measured CFM equal to scheduled CFM, notify Designer immediately.

m. For economizer systems with ATC subcontractor’s presence and assistance, adjust minimum and maximum outdoor air CFM to quantities shown on schedules. Place outdoor air dampers in minimum position as adjusted by ATC contractor. Measure temperature in mixed air plenum, temperature of outdoor air and by proportioning determine % of outdoor air being supplied. Place outdoor air damper in maximum open position or fully open variable outside air damper and repeat above measurements.

n. For systems with variable volume boxes or constant volume boxes do the following, with ATC Contractor present for necessary coordination:
   1) At static pressure probe location in field with number of stats necessary to approximate installed diversity calling for full cooling, measure static pressure with manometer and compare with reading registering at DDC system field panel or CRT. The "most critical" volume box shall be determined by the Designer from approved sheet metal shop drawings submittals. Typically the pressure drop from the supply fan outlet to this box inlet is greater than for any other box. Observe damper linkage, at this box, instruct ATC contractor to vary static pressure setpoint as required so that with stats calling for full cooling, most critical box damper is 75% open. (Score line on damper linkage and mark full open and closed positions of box damper. Using protractor mark 75% position open position on volume box.)
   2) At each variable volume box, confirm that thermostat and box controller are of the same type (i.e., direct acting or reverse acting). At each variable box and constant volume box disconnect the actuator's pneumatic air line and confirm that box damper fails to position called for on control drawings.
   3) At each variable volume box, set thermostat serving box for no cooling. At box test ports take differential pressure reading with magnehelic gauge. Note the magnehelic must be calibrated against a manometer before use. Adjust box minimum position at controller so that differential pressure reading corresponds to box minimum primary air CFM shown on schedules. Place thermostat controlling box to full cooling position. Using magnehelic

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gauge adjust box controller maximum position setting to produce differential pressure corresponding to box maximum primary air as shown on schedules. Measure CFM's from all diffusers served by box. Confirm total agrees with scheduled box cfm. If box has a reheat coil set start to call for full heating and confirm that box diverting relay switches to heating operation at proper thermostat pressure. With magnehelic gauge confirm differential pressure corresponding to heating CFM. Confirm that P/E’s controlling electric heating coils (if any) stage properly. Confirm that hot water control valve modulates open.

4) At each fan box, set thermostat serving box for full heating. At box test ports take differential pressure rating the magnehelic gauge. Adjust box minimum position at controller so that differential pressure reading corresponds to box minimum primary air CFM shown on schedules. With stats continuing to call for full heating, confirm that fan is operating. Measure CFM's or all diffusers that the box serves and adjust fan speed controller, and/or inlet damper to produce CFM for box as shown on schedules. Place thermostat controlling box to full cooling position. Using magnehelic gauge adjust box controller maximum position setting to produce differential pressure corresponding o box maximum primary air as shown on schedules.

5) At each constant volume box, use magnehelic gauge to adjust set point of box controller to differential pressure corresponding to velocity (airflow) scheduled for box.

o. Balance each diffuser on each floor to within 10% of scheduled values. Follow procedures in SMACNA manual referenced above.

p. For constant volume systems, perform pitot tube traverses for branch ducts on each floor. Adjust volume dampers to produce design CFM for each branch.

q. Traverse all exhaust ducts. By sheave adjustment or damper throttling balance fans to +10% airflow scheduled on drawings.

r. Balance supply air systems in unfinished areas:
   1) Supply air systems shall be balanced after installation of items related to same systems with exception of duct taps to air diffusers in interior zones.
   2) Balance as required to deliver air volume at outlets within 10% of design flow shown on Drawings.
   3) Provide sufficient temporary openings in interior zone duct systems to adjust interior zone air volumes.
   4) Readjust air volumes after completion and occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.

s. For fume hoods, open sash fully. Take six point reading across face of hood using hot wire anemometer or velometer with low flow probe (or average air across entire face of hood with rotating vane anemometer). Adjust volume damper in hood exhaust ductwork so that average velocity across hood face is +100 FPM.

4. Water Balancing and Adjusting
   a. Balancing shall not begin until systems have been installed complete, including pumps, piping, valves and coils.
   b. Make adjustments as required to deliver water volumes at coils and equipment within 5% of design flow, or as required to properly balance cooling and heating loads throughout conditioned areas.

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c. Adjustments in water volumes shall be made in manner satisfactory to Designer.

d. Report on system performance shall include:
   1) Manufacturer, size, type, location including room number, and zone of each coil and piece of equipment.
   2) Design and actual water flow.
   3) Complete nameplate data for each piece of equipment reported.
   4) Complete identification of data.

END OF SECTION
SECTION 260001

ELECTRICAL
(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1- GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. This contractor must be familiar with all other Divisions and Sections of the Specifications which affect the work of this section.

C. All contractors are hereby advised that Alternate Prices are requested which may affect the scope of work of this section. Refer to Section 01230 for a complete description of all alternates.

D. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the University of Massachusetts at a time and place as stipulated in the Notice to Contractors.

   The following should appear on the upper left hand corner of the envelope:
   
   Project Name: Morrill I and IV North 1st and 3rd Floor Microbiology Consolidation
   
   Name of Bidder: ______________________
   
   
   Sub-Bid for Section: Section 260001 – Electrical

2. Each sub-bid submitted for work under this section shall be on forms furnished by the University as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be found on pages 63 and 64 of the boiler plate.

3. Sub-bids filed with the University 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 “COMMONWEALTH OF MASSACHUSETTS” in the amount of five percent (5%) of the bid. A sub-bid accompanied by any other form of bid deposit will be rejected.

E. List of Drawings: The work to be completed by the Filed Subcontractor for the work of this section is shown on the following drawings. The Subcontractor shall carefully inspect all the listed drawings, not just those pertaining particularly to this subtrade unless specifically called out otherwise, regardless of where among the Drawings it appears:

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1.2 GENERAL PROVISIONS

A. PART A and DIVISION 1 of PART B, as listed in the TABLE OF CONTENTS, are hereby made part of this SECTION by reference thereto.

B. After inspecting existing conditions at the site, examine the various trade SECTIONS of the Specifications and be thoroughly familiar with all provisions regarding work included herein.

1.3 SCOPE OF WORK

A. Conditions of the Contract and Division 1, General Requirements, apply to work of this Section. Where paragraphs of this Section conflict with similar paragraphs of Division 1, requirements of this Section shall prevail.

B. Examine Drawings and other Sections of Specifications for requirements that affect work of this Section.

C. As used in this Section, “provide” means “furnish and install” and “HVAC” means “Heating, Ventilating, and Air Conditioning” and “POS” means “Provided Under Other Sections”. “Furnish” means “to purchase and deliver to the project site complete with every necessary appurtenance and support,” and “Install” means “to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation and the proper location in the project.”

D. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation. Drawings and Specifications from complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation. Remove all debris caused by contractors’ work.

E. Drawings are diagrammatic and indicate general arrangement of systems and work included in Contract. It is not intended to specify or to show every offset, fitting or component; however,
Contract Documents require components and materials whether or not indicated or specified as necessary to make the installation complete and operational.

F. Perform work strictly as required by the rules, regulations, standards, codes, ordinances, and laws of local, state, and federal government, and other authorities that have lawful jurisdiction.

G. Give notices, file plans, obtain permits and licenses, pay fees and obtain necessary approvals from authorities that have jurisdiction.

H. As work progresses and for duration of Contract, maintain complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately, including work installed as a modification or addition to the original design.

I. Work shall include, but shall not be limited to, the following:
   1. New electrical service panels, new feeders for panels.
   4. Safety disconnect switches (fused or unfused).
   5. Fuses.
   6. Lighting fixtures including lamps and fuses.
   7. Fluorescent ballasts.
   8. Conduit and raceways.
   9. Wire and Cable.
  11. Underfloor poke-through receptacles
  12. Wiring devices and plates
  13. Addressable Fire alarm control system devices and wiring, to tie into existing Simplex Addressable fire alarm control panel.
  14. Fire seal and fire-proof foam.
  15. Sleevings.
  16. All cores required for electrical equipment and conduit shall be provided by the electrical contractor.
  17. Staging, scaffolding, ladders, chutes and other construction aids as required for all electrical work.
  18. Pull boxes and cable troughs.
  20. Supervision and approval.
21. Electrical connections to HVAC and Plumbing equipment, and other equipment provided under other Sections or by Owner.

22. Nameplates, labels and tags.

23. Testing

24. Required Electrical and Fire Alarm permits shall be paid for by the EC.

25. Removal of all tel/data cabling that is identified to be no longer necessary due to demolition.

26. Electrical Demolition of Existing Electrical Items

27. Install the following items furnished under other Sections or by Owner.

28. Starters furnished under Sections 15400, 15500, and 15600.

29. Main distribution panels.

30. Marking system for emergency lighting fixtures.

31. Cable tray installation in computer rooms.

1.4 CONTRACT DOCUMENTS

A. Work to be performed under this Section is shown primarily on the Electrical Drawings.

B. Electrical Contractor shall refer to Architectural, Fire Protection, Plumbing, HVAC, Electrical, Structural, and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.

C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless or whether or not this instruction is explicitly stated as part of the indication or description.

D. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

E. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational. Information and components shown on riser diagrams, but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.

1.5 REFERENCES
A. For products or workmanship specified by association, trade, or federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The date of the standard is that in effect as the Bid date, except when a specific date is specified.

C. Schedule of References:

1. ASNI  American National Standards Institute
2. ASTM  American Society for Testing and Materials
3. FM    Factory Mutual System
4. IEEE  Institute of Electrical & Electronics Engineers
5. NEMA  National Electrical Manufacturer’s Association
6. NFPA  National Fire Protection Association
7. UL    Underwriters’ Laboratories, Inc.
8. OSHA  Occupational Safety and Health Administration

1.6 VERIFYING CONDITIONS

A. Before commencing any work under this section, verify all governing dimensions and examine all adjoining work on which this work is in any way associated or connected. Failure to visit the jobsite will in no way relieve the Contractor from installing the work according to the intent of these specifications and at no additional cost to the Owner.

B. Each bidder shall visit the site and inspect conditions affecting the proposed work. Failure to do so and misinterpretation of the Plans and Specifications resulting there from shall be entirely the responsibility of the bidder.

C. Each bidder shall make note of the existing conditions affecting hauling, rigging, transportation, installation, etc., in connection with his work and shall make all provisions for transportation of all materials and equipment.

D. Where field conditions require, the Contractor shall arrange for equipment to be shipped to the job, dismantled and assembled in place.

1.7 CODES, STANDARDS, AUTHORITIES AND PERMITS

A. Perform work in strict accordance with the rules, regulations, standards, codes, ordinances, and laws of local, state, and federal governments and other authorities having legal jurisdiction over the site.

B. Underwriters’ Laboratories (UL) shall list material and equipment.

C. Give all notices, file all plans, obtain all permits, pay all fees 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 Architect/Engineer, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work conforming to requirements, satisfactory to Architect, and without extra cost.
to the Owner. If work is covered before due inspection and approval, the installing contractors shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.8 COORDINATION, SEQUENCING AND SCHEDULING

A. Close coordination with other trades is required for performing this work. Bidder shall become thoroughly familiar with the requirements of Division 1, pertaining to coordination, including coordination drawings, scheduling, service interruptions and utility bypassing, layout for coring and other specified coordination. Pay particular attention to the following sections:

1. Section 017329 – Cutting & Patching for requirements pertaining to the installation of the Work of this trade.

2. Section 013100 - Project Management and Coordination, for requirements pertaining to coordination drawings.

3. Section 015000 – Temporary Facilities and Controls, for temporary work to be provided by this Contractor, and for information pertaining to service interruptions.

4. Section 024119 – Selective Demolition, for requirements pertaining to the coordination of new utility routing prior to the start of demolition.

5. Section 078413 – Firestopping, for fire stopping around work which is penetrating fire-rated wall and floor assemblies.

1.9 DISCREPANCIES IN DOCUMENTS

A. Address questions regarding drawings to Architect in writing before award of contract; otherwise, Architect’s interpretation of meaning and intent to drawings shall be final.

1.10 SITE VISIT

A. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer.

1.11 GUARANTEE AND 24 HOUR SERVICE

A. Guarantee work in writing for one year from date of final acceptance. Repair or replace defective materials or installation at no cost to Owner. Correct damage caused in making necessary repairs and replacements under guarantee at no cost to Owner.

B. Submit guarantees to Architect before final payment.

C. Statement of guarantee requirements shall not be interpreted to limit owner’s rights under law and this contract.
D. Guarantee that all work installed will be free from any and all defects in workmanship and/or materials and that all apparatus will develop capacities and characteristics specified.

E. If, during a period of one year from the date of final completion and acceptance of the work, any such defects in workmanship, material or performance appear, the Electrical Sub-Contractor will, without cost to the Owner, remedy such defects within a reasonable time to be specified in notice from the Architect.

1.12 CLEANING

A. During the progress of the electrical work, clean up and remove all debris caused by this work. At completion, the Contractor shall clean all electrical equipment and systems and leave all work in perfect operating condition.

1.13 RESPONSIBILITY

A. The structure and its appurtenances, clearances and the related services, such as plumbing, heating, ventilation and electric service have been planned to be legal, adequate and suitable for the installation of equipment specified under this section. The owner will not assume any increase in cost caused by differing requirements peculiar to a particular make or type of equipment, and any incidental cost shall be borne by the Electrical Sub-Contractor. He shall be responsible for the proper location of his required sleeves, chases, inserts, etc., and see that they are set in the forms before the concrete is poured. He shall be responsible for his work and equipment furnished and installed by him until the completion and final acceptance of this contract, and shall replace any work which may be damaged, lost or stolen, without additional cost to Owner.

1.14 PROTECTION OF WORK AND PROPERTY

A. Materials, fixtures and equipment shall be properly protected and all floor openings/conduit openings shall be temporarily closed so as to prevent obstruction and damage.

B. Protect and preserve all materials, supplies and equipment of every description and all work performed. Protect all existing equipment and property of any kind from damage during the operations. Damage shall be repaired or replaced promptly by the Contractor at his expense.

1.15 SAFETY PRECAUTIONS

A. Life safety shall be a primary consideration. The contractor shall provide all required and prudent material, labor and equipment to comply with applicable safety regulations. Further, the Electrical Contractor shall similarly provide all material, labor and equipment to comply with reasonable or generally accepted safety precautions as directed by the Owner or the Architect.

B. Comply with all of the safety requirements of the OSHA throughout the entire construction period of the project.

C. Furnish, place and maintain proper guards for prevention of accidents and any other necessary construction required to secure safety of life and property.
D. Perform work only in areas of the building as approved by the Owner or his representative. Personnel and equipment access to the site, laydown areas, parking areas and areas of work shall only be as designated and allowed by the Owner.

E. Also refer to Division 1, Safety Requirements.

1.16 SURVEYS AND MEASUREMENTS

A. Under this section of the Specification, base all required measurements, both horizontal and vertical, from referenced points established 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 Architect in writing and do not proceed with the related work until instructions have been issued.

C. Prior to bid, the Contractor shall visit the site and review the drawings to familiarize himself with the areas of work as well as the existing conditions to which the work of this section is to be installed, prior to design or installation. Any apparent discrepancies or conflicts between the new work and any existing conditions shall be submitted to the Architect in writing. Failure of the contractor to familiarize himself with all aspects of the new work and the existing conditions will not be a basis for extra costs to the contract.

1.17 COOPERATION AND COORDINATION WITH OTHER TRADES

A. The work shall be so performed that the progress of the entire building construction including all other trades shall not be delayed or interfered with. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as directed.

B. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any conflicts shall be referred immediately to the Architect for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Architect’s satisfaction, at no expense to the Owner.

C. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section will interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment.

D. Keep fully informed as to the shape, size and position of all openings required for all apparatus and give information in advance to build openings into the work. Furnish and set in place all sleeves, pockets, supports and incidentals.

E. This Subcontractor shall, with the approval of the Architect and without extra charge, make reasonable modifications in his work as required by normal structural interferences, or by interference with work of other trades, or for proper execution of the work.
F. This Subcontractor shall protect all materials and work of other trades from damage that may be caused by his work and shall make good any damages so caused.

G. This contractor shall cooperate with the sprinkler and mechanical contractors regarding the installation of the new ductwork and new sprinkler systems. The relocation of existing conduits and the conductors within the conduits shall be coordinated with the other trades such that they do not impact the schedule.

1.18 INTERPRETATION OF DRAWINGS

A. It is the intention of the Specifications and Drawings to call for finished work, tested and ready for 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 Contractor without additional expense to the Owner.

B. The Drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the project and shall have the approval of the Engineer before being installed. The Contractor shall follow 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 Engineer before proceeding with the installation. The Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. Size of conduit and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge. All work shall be installed in such a manner as to avoid being unsightly.

D. All measurements shall be taken at the building by the Contractor, prior to purchasing and installing the equipment and conduit.

E. Existing conduits shown to be relocated are approximate. Not every conduit was shown. The contractor shall provide labor and associated materials to remove all necessary conduits in the hallways on the lower floor to provide space for the installation of HVAC ductwork and piping.

1.19 CUTTING AND PATCHING

A. Refer to Section 017329 – Cutting and Patching.

B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.

C. All such cases, openings, and sleeves shall be located accurately of the proper shape and size and shall consult with the Engineer in reference to this work. In so doing, 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 Engineer.

D. All of this work shall be carefully done by workmen competent to do such work and with the proper and smallest tools applicable.

E. Any cost caused by defective or ill-timed work shall be the respective contractor’s responsibility therefore.

1.20 ACCESSIBILITY

A. All work shall be installed so that parts requiring inspection, operation, maintenance and repair are readily accessible. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Architect.

1.21 SUBMITTALS

A. Submit shop drawings and product data within 30 days after award of contract. Check, stamp and mark with project name submittals before transmitting to Architect. Indicate deviations from contract documents.

B. Deviations from contract documents or proposed substitutions of materials or equipment for those specified shall be requested in separate letter whether deviations are due to field conditions, standard shop practice, or other cause.

C. Within four weeks (except as noted otherwise) after award of contract and before ordering materials or equipment submit list of proposed materials and equipment and indicate manufacturer’s names, addresses and identifying data. No consideration will be given to partial lists submitted out of sequence.

D. Schedule at least ten working days, exclusive or transmittal time for submittal review.

E. Material and equipment requiring Shop Drawing and Product Data submittal shall include but shall not be limited to:

1. Panelboards, circuit breakers, transformers.
2. Safety disconnect switches (fused or unfused)
3. Lighting fixtures.
4. Surface mounted raceway
5. Wiring devices and plates
6. Addressable Fire alarm System including equipment/device cuts.
7. Cable tray.

F. Furnish items for installation under other Sections or by Owner, and wire as required:

1. Duct heat and smoke detectors; note that control wiring for fan shut-down will be provided under Section 155000.
G. Install the following items furnished under other Sections or by Owner.

   1. Starters, except starters in motor control centers, furnished under Sections 154000 and 155000.

H. Remove, extend, alter and reconnect existing conduits as directed by Architect. Reconnect existing conduit that is cut and disconnected to accommodate work. Pull in new wires between nearest accessible outlets intended for reuse. Provide new conduit where wire cannot be pulled in existing. Connect new and existing work to function as complete, continuously grounded system. Remove conduit and equipment not intended for reuse and store where directed. Use conduit exposed by Work of this Contract in conjunction with nearest outlet intended for reuse as directed.

1.22 STANDARDS

A. The latest published issue of standards, recommendations, or requirements of the following listed societies, associations, or institutes in effect at the date of Contract are part of this Specification. These shall be considered as minimum requirements; specific requirements of this specification and/or associated drawings shall have precedence. In case of conflict between published requirements, the Owner’s representative shall determine which is to be followed.

   1. ANSI American National Standards Institute
   2. IEEE Institute of Electrical and Electronic Engineers
   3. NEMA National Electrical Manufacturers Association
   4. NFPA National Fire Protection Association
   5. UL Underwriters’ Laboratories, Inc.
   6. OSHA Occupational Safety and Health Act
   7. NEC National Electric Code

1.23 OBTAINING INFORMATION

A. Obtain from the manufacturer the proper method of installation and connection of the equipment that is to be furnished and installed. Obtain all information that is necessary to facilitate the work and to complete the project.

1.24 GIVING INFORMATION

A. Keep fully informed as to the size and shape and location of all openings required for all apparatus and give full information to all other Contractors. Furnish all supports required for installation of apparatus herein specified.

1.25 SEISMIC RESTRAINT REQUIREMENTS

A. Provide seismic restraints for conduit, lighting and equipment in accordance with the requirements of the Massachusetts State Building Code, 780 CMR, 6th Edition, and referenced requirements of BOCA and NFPA.

1.26 RELATED WORK IN OTHER SECTIONS
A. The following work is not included in this section:

1. Motor Starters, if not in Motor Control Centers.

2. Motors will be furnished and set in place under other sections.

3. Temporary water, heat, gas and sanitary facilities for use during construction and testing.

4. Automatic temperature control wiring.

5. Installation of duct-mounted smoke detectors.

1.27 MATERIAL AND EQUIPMENT STANDARDS

A. All equipment and material must be approved by the Architect/Engineer prior to use. Substitutions may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified and only if the term “approved equal” appears. The request for each substitution must be accompanied by complete specifications together with drawings or samples to properly appraise the materials, equipment or process.

B. If a substitution of materials or equipment in whole or in part is made, the Electrical Contractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.

C. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers.

1.28 SUPERVISION

A. Supply the service of an experienced and competent supervisor who shall be in charge of the electrical work at the site.

1.29 DELIVERY, STORAGE AND HANDLING

A. All manufactured materials shall be delivered to the site in original packages or containers bearing the manufacturer’s labels and product identification.

B. Protect materials against dampness. Store off floors, under cover, and adequately protected from damage.

C. Deliver products to site and store and protect same under the provisions of Division 1.

D. Thoroughly inspect all electrical equipment and materials upon receipt at the job site for damage and correctness.

1.30 FINAL ACCEPTANCE
A. Final acceptance of Ownership of the Electrical system installed within this scope of work shall be contingent on passing a satisfactory system tests, performance test and other tests required in this spec to determine that the system will perform according to the contract requirements.

B. The work shall be so performed that the progress of the entire building construction, including all other trades, shall not be delayed or interfered with. Materials and apparatus shall be installed as fast as conditions permit and must be installed promptly when and as desired.

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 Engineer for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Engineer’s satisfaction, at no expense to the Owner.

D. Operation and Maintenance Manuals (O & M) must be reviewed by the University’s Physical Plan Facilities Department prior to contractor’s retainage being paid.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. Rigid metallic conduit shall be zinc-coated steel that conforms to industry standards, by Allied Tube and Conduit, Republic Steel, Wheatland Tube or approved equal.

B. Intermediate metal conduit (IMC) shall be zinc-coated steel that conforms to industry standards, by Allied tube and Conduit, Triangle/PWC or approved equal.

C. Electrical metallic tubing (EMT) shall be zinc-coated steel that conforms to industry standards, by Republic Steel, Allied Tube and Conduit, Triangle/PWC or approved equal.

D. Wireways shall be sheet steel with hinged spring-latched covers, galvanized or painted to protect against corrosion. Provide necessary bends, couplings, connectors and other appurtenances. Interior parts shall be smooth and free of sharp edges and burrs. Wireways shall be by Square D or approved equal.

E. Flexible metallic conduit shall be galvanized, spiral wrapped metallic conduit (Greenfield) or liquid-tight flexible metallic conduit as specified for specific equipment.

F. Conduit fire seat fittings shall have heat-activated intumescent material for fire rating equal to or higher than that of the floor or wall by O.Z./Gedney or approved equal.

G. Provide threaded malleable iron or steel connectors and couplings with insulated throats; manufactured elbows; locknuts; and plastic or bakelite bushings at terminations, as necessary. Couplings and connectors shall be gland and ring compression or stainless steel multiple point locking or steel concrete-tight set screw. Compression couplings and connectors shall form positive ground. Set-screw connectors and couplings shall have wall thickness equal to conduit, care-hardened, hex-head screws and separate ground wire. Bushings for rigid steel conduit and connectors for EMT shall have insulating inserts that meet requirements of UL 514 flame test.
2.2 OUTLET BOXES

A. Outlet boxes on concealed work shall be at least 4” square or octagonal, galvanized pressed steel with plaster rings as required. Outlet boxes for exposed conduit work shall be cast aluminum alloy with cast aluminum covers.

B. Where installed in plaster, boxes shall be fitted with galvanized steel plaster covers of required depth to finish flush with finished wall or ceiling.

C. Switch boxes, receptacle boxes and other outlet boxes shall be standard 4” square with plaster rings or gang covers as required.

D. Outlet boxes shall be by Steel City Electric Company, Appleton Electric Company, and National Electric Products Company or approved equal.

E. Outlet boxes for various systems and components shall be as required by manufacturer.

F. Waterproof boxes shall be Condulet Cast Boxes with water-proof devices and covers. Provide hot-dipped galvanized corrosion-resistant epoxy enamel finish or PVC-coated products, where noted on Drawings. Exterior devices must be provided with weathertight in use cover plates.

G. Provide screw-joint outlet boxes, with gasketed weatherproof covers in exterior locations, where exposed to moisture and where indicated as weatherproof on Drawings.

H. Provide only enough conduit openings to accommodate conduits at individual location. Each box shall be large enough to accommodate number and sizes of conduits, wires and splices to meet NEC requirements, but shall be at least size shown or specified. Necessary volume shall be obtained by using boxes of proper dimensions. Box depths greater than 2-1/8” shall not be used to obtain necessary volume, but may be used with Architect’s approval to facilitate installation. Standard concrete boxes may be 6” deep where necessary to permit entrance of conduits into sides of boxes without interference with reinforcing bars. Octagonal hung ceiling boxes with suspension bars may be 3-1/2” deep. Rectangular boxes for inter-connection of branch circuit conduits may be 2-1/2” deep. Boxes shall not be smaller than 2 1/8” depth unless required due to a narrow wall condition. If a narrow wall condition is present the contractor must coordination each location with the architect/engineer. The devices may be relocated or the narrow box may be approved.

2.3 JUNCTION BOXES, PULL BOXES AND CABLE TROUGHS

A. Provide code gauge galvanized steel junction and pull boxes for conduit 1-1/4” trade size and larger, where indicated and as necessary to facilitate installation, of required dimensions, with accessible, removable screw-on covers. Provide junction and pull boxes in special sizes and shapes determined in field where necessary.

B. Junction box covers shall be accessible. Do not install junction boxes above suspended ceilings except where ceiling is removable or where access panel is provided.
C. Sheet metal pull boxes shall be supported adequately to maintain shape. Larger boxes shall have structural steel bracing welded into rigid assembly formed adequately to maintain alignment in shipment and installation. Secure covers with corrosion-resistant screws or bolts.

1. Pull boxes exposed to rain or in wet locations shall be weatherproof.

2. Aluminum conduit is not allowed.

3. Provide clamps, grids and other appurtenances to secure cables. No cable shall be unsupported for more than 30”.

4. No pull box shall be within 2 feet of another.

5. Provide sealed, cast-alloy, hazardous-location boxes with sealing fittings in garages and other areas in which flammable gases or vapors may be present to prevent transmission of gases or vapors through conduits.

6. Pull boxes connected to concealed conduits shall be mounted with covers flush with finished wall or ceiling. No aluminum pull box shall be embedded in concrete.

D. Provide cable troughs of special shapes, design and construction required to install, support and enclose feeder cable throughout indicated routing. Troughs shall be as specified above for junction and pull boxes, with reinforcing, insulating supports and clamping for cable installation. Cables shall be continuous throughout troughs, and shall be racked in distributed phase groupings arranged with phase cables surrounding neutral conductors.

2.4 WIRE AND CABLE (600 V INSULATION)

A. Provide single-conductor, annealed copper wire and cable with insulation rated 600 V, of sizes specified and scheduled on Drawings and as required by code, whichever is larger, by General Electric, Rome, Okonite or approved equal, for secondary service, feeders, branch and system wiring. Wire insulated for 300 V may be used where voltage is less than 100 V, if isolated from higher voltages. Wire sizes shown and specified are American Wire Gauge for copper.

B. Armored cable shall be Type AC 600 V copper with full-sized insulated ground conductor. Use if restricted by requirements of Paragraph entitled WIRING METHODS in Part 3 of this section. Minimum size shall be #12 AWG unless specified otherwise.

C. Wire #8 and larger shall be stranded; #10 and smaller shall be solid. Wire and cable shall have THWN-THHN or XHHW insulation.

D. Motor cable circuits and signal wiring may be #14 if NEC requirements are met. Branch circuits longer than 75’ for 120 V and 175’ for 277 V shall be at least #10 from panel to last outlet.

E. Wiring within light fixtures and other high-temperature equipment shall have 150°C insulation as required by NEC.

F. Splices and Terminations
1. Make splices in branch circuit wiring with UL-listed, solderless connectors rated 600 V, of sizes and types required by manufacturer’s recommendations with temperature ratings equal to those of wires. Splice connectors shall be screw-on. Insulate splices with integral covers or with plastic or rubber friction tape to preserve characteristics of wire and cable insulation.

2. Provide standard bolt-on lugs with hex screws to attach copper wire and cable to panelboards, switchboards, disconnect switches and electrical equipment.

3. Make terminations and splices for conductors #6 and larger with corrosion-resistant, high conductivity pressure indent, hex screw or bolt-clamp connectors, with or without tongues, designed specifically for intended service.

4. Ampacity of splices and connectors shall be equal to those of associated wires and cables.

2.5 FEEDER IDENTIFICATION

A. Provide nonferrous identifying tags or pressure-sensitive labels for cables, feeders, and power circuits in switchboard at cable termination.

B. Tags or labels shall be stamped or printed to correspond with markings on Drawings or marked so that feeder cable may be identified readily. If suspended tags are provided, attach with 1/32” diameter nylon 55-pound test monofilament line or slip-free plastic cable lacing unit.

2.6 COLOR CODING

A. Color code secondary service, feeders and branch circuit conductors as follows:

<table>
<thead>
<tr>
<th>208/120 Volts</th>
<th>480/277 Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Brown</td>
</tr>
<tr>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>Blue</td>
<td>Yellow</td>
</tr>
<tr>
<td>White</td>
<td>Gray</td>
</tr>
<tr>
<td>Green</td>
<td>Green</td>
</tr>
</tbody>
</table>

B. Colors shall be factory-applied entire length of conductors by one of the following methods except as noted and limited below:

1. solid color compound,

2. solid color coating,

3. colored stripping (2 stripes 180 degrees apart),

4. colored bands or hash marks with maximum spacing of 18”,

5. colored fibrous covering,
6. Surface printing every 12”, maximum spacing of 18”.

C. Branch circuit conductors #12 and #10 shall have solid color compound, solid color coating. Neutrals and equipment grounds shall have solid compound or solid color coating (white, gray and green), except that neutrals with colored stripe shall be used where required by NEC. Conductors #8 and larger with stripes, bands or hash marks shall have background color other than white, green and gray.

D. Solid color coating, stripes, bands or has marks shall be strongly adherent paint or dye, sufficiently wide and clear to be readily distinguishable after installation.

E. Alternative field-applied color coding methods may be lied for wire #10 or larger, with color code specified in Subparagraph A:

1. Apply ¾” colored pressure-sensitive plastic tape in half overlapping turns for 6” from all terminal points and in boxes in which splices or taps are made. Apply last two laps of tape with no tension. Do not cover cable identification markings.

2. Identify with nylon, self-extinguishing, self-locking colored cable ties. Ties shall accommodate wire sizes 1/16” through 1-3/4” in diameter and shall not be less than 0.18” wide. Minimum tensile strength shall be at least 50 lbs. Temperature range shall be -65°F to + 350°F. Provide three ties to each wire at each terminal point starting 3” from terminal and spaced 3” apart and three ties to each wire in boxes where splices or taps are made with special tools or pliers, and cut off excess.

2.7 WIRE PULLING EQUIPMENT

A. Provide polyethylene ropes for pulling wire.

B. Provide fish wires in telephone and data conduits and other empty conduit systems required, without splices and with ample exposed lengths at each end, to allow for pulling of telephone and computer cabling.

C. Provide wire pulling lubricants that meet applicable UL requirements as necessary.

2.8 WIRING DEVICES

A. Provide wiring devices by single manufacturer. Cooper (Division of Crouse-Hinds), Leviton, Bryant, Hubbell or approved equal. Catalog designations of Cooper are specified to establish standards of quality for materials and performance. Devices shall be the color to match existing.

B. Toggle Switches:

1. Single-pole shall be No. CSB120B, 20A., 120-277 V AC.

2. Double-pole shall be No. CSB220B, 20A., 120-277 V AC.

3. Three-way shall be No. CSB230B, 20A., 120-277 V AC.
C. Receptacles:
   2. Duplex shall be No. 5362W, 125 V, 20A, 2-pole, 3 W, grounding.
   3. All outlets other than 20 amp 120 volt receptacles shall be verified to be appropriate for the equipment being served, prior to installation.
   4. Color: Black and grey to match lab bench work surface and Ivory at the walls.

2.9 WIRING DEVICE PLATES

A. Provide 0.040 brushed stainless steel device plates by Cooper, Leviton, Bryant, Hubbell or approved equal.
B. Device plates shall be manufacturer of wiring devices.
C. Receptacle device plates for circuits other than 120 V, 2-wire, shall be engraved with ¼” letters, filled red, indicating voltage characteristics and circuit number of outlet.
D. Outlets shall be fully recessed to surface.

2.10 SAFETY DISCONNECT SWITCHES

A. Provide quick-make/quick-break safety switches: Type HD, heavy duty, Class 3, Design 3, unless specified otherwise. Provide NEMA 1 or NEMA 12 enclosure for dry applications and NEMA 3R for wet. Switches shall be rated 250 Volts or 600 Volts, as required for voltage of associated circuit and shall be rated in horsepower. Fuses shall interrupt locked rotor current of associated motor or ten times full rates load current, whichever is greater.
B. Mount switch parts on insulating bases to facilitate replacement from front of switch. Current-carrying parts shall be high-conductivity copper. Contacts shall be silver-tungsten or plated. Provide positive pressure fuse clips and switch operating mechanism suitable for continuous use at rated capacity without auxiliary springs in current path.
C. Switches shall withstand available fault current or let-through current before operating, without damage or rating change.

2.11 FUSES

A. Provide current limiting, high-interrupting-capacity fuses for equipment provided under this and other Sections. Except as specified otherwise, provide 10% spares at least three of each size, in cabinet in main electric room. Cabinet trim shall match that of panelboard trim. Coordinate with equipment manufacturers and with work of other Sections.
B. Fuses 600 A and smaller that serve motors, fusible circuit breaker panelboards, transformers and motor control centers shall be dual-element current limiting Class RKI or approved equal.
C. Submit specific fuse locations, types, manufacturers and ratings. Test data will be waived if fuses are products of single manufacturer and selectivity is sustained by published catalog data. Provide data for short circuit and protection coordination study as directed.

D. Switch sizes and fuse ratings shown on Drawings and specified represent general approximate values for each motor hp delineated. Coordinate fuse values with motor switch sizes. Obtain recommended fuse rating data from fuse manufacturer. In case of discrepancy between Contract Documents and manufacturer’s recommendations shall govern work. Revise switch size to accommodate recommended fuse values and revise assembled equipment as necessary. Furnish necessary change information to equipment manufacturers. Submit changes in switch sizes to Architect for approval. Certify that motor circuits have adequate short circuit protection with fuses provided.

2.12 LIGHTING FIXTURES

A. General

1. Provide lighting fixtures, equipment and components where shown on Drawings, as listed in fixture schedules and as specified, wired and assembled. Provide approved aligner canopies, hangers and other appurtenances as required.

2. This specification contains descriptive criteria. Where no manufacturer’s name is listed as standard of quality, Architect’s decision concerning the conformity of the product to Contract Documents requirements shall be final.

B. Lamps

1. Provide lamps by General Electric, Phillips or Sylvania, unless specified or shown on Drawings otherwise. Obtain most recently published performance criteria.

2. Lamps shall meet ANSI C78 requirements.

3. Guarantee lamps for 90 days after acceptance by Architect. Replace lamps that fail during that time at no cost to Owner.

4. Lamps shall be new unless specified or shown on Drawings otherwise.

5. Do not operate lamps before final inspection by Architect except for initial testing. Initial lumen output shall not be measured before 100 hours of operation. Utilize temporary lighting.

6. Fluorescent lamps shall meet LM-9 and LM-40 IES testing and measurement requirements. Provide circuit interrupting lampholders. Compact fluorescent lamps shall have end of life sensing to turn off lamps.

C. Ballasts

1. General
a. Provide ballasts by General Electric, Advance, Universal or approved equal. Ballasts shall be ETL-CMB and UL-listed unless specified or shown on Drawings otherwise.

b. Ballasts shall have at least 0.95 power factor unless specified otherwise. Input voltage shall be as shown on Drawings.

c. Furnish manufacturer’s two-year warranty, including replacement parts and labor. Date of manufacture shall be stamped on nameplate.

d. Ballasts shall not contain PCB.

2. Emergency Ballasts

a. Fluorescent fixtures containing emergency ballasts shall be equal to Bodine or Lithonia ballasts. All fixtures with emergency ballasts shall be provided with a marking system indicating it’s function as an emergency fixture. Provide a system to be reviewed and approved by the facilities department.

3. Fluorescent Ballasts

a. Ballasts shall be CBM certified and meet ANSI C82 and UL 935 requirements.

b. No more than three lamps shall be served by one ballast, unless specified on Drawings otherwise.

c. Ballasts shall have current leakage of less than 50 milliamperes.

d. Furnish GLR fuse and fuse holder sized and installed by luminaire manufacturer, in addition to internal ballast thermal protection.

e. Ballasts shall have sound rating A (20-25 dB) unless specified otherwise.

f. Indoor ballasts shall have starting temperature of at least 50°F.

g. Outdoor ballasts shall have starting temperature of at least 0°F for 430 mA and -20°F for 800-1500 mA.

h. Ballasts shall be electronic with a total harmonic distortion of less than 10% (THD <10%)

2.13 PANELBOARDS

A. Provide UL-listed safety dead-front lighting and power panelboards where shown on Drawings and as scheduled. Panelboards shall meet or exceed requirements of NEMA Standard Publication PB-1, and UL-50 and 67. Provide cabinets with flush hinges and combination catch and lock. Provide wiring gutters to accommodate large multiple feeder cables and lugs. Except
as shown otherwise on Drawings, wiring gutters shall be at least 4” for lighting and 208 V panels.

B. Where two section panels are required, bolt boxes together to form one unit. Trim shall be two-piece construction with doors of equal size over each section.

C. Provide molded case, bolt-on, thermal-magnetic trip, single, two or three pole branch circuit breakers as shown on Drawings. Multiple pole breakers shall be single handle, common-trip. All circuit breakers shall be rated for switching purposes.

D. Main buswork of panels shall carry at least full rating of feeder overcurrent device that supplies panel.

E. Provide separate equipment ground bus for each panelboard. Ground bus shall be insulated from panel enclosure where isolated ground bus is indicated on the drawings.

F. Power and lighting panels shall have heavy-duty, continuous, section vertical-hinged to box section for access to wiring gutters in addition to trim door.

G. Panelboards shall have integrated short circuit current rating equal to or greater than circuit breaker AIC ratings schedule on Drawings.

H. Panels shall be by Square D, Type NQOB for 225 A and below, and I-line distribution for 400 A and above, or equal by Siemens, Cutler Hammer, or approved equal.

I. Provide surface metal tubs ready for painting.

J. Provide bus connections for future overcurrent device with suitable insulation and bracing to maintain proper short circuit rating and voltage clearances, where required on Drawings. Provide for ready insertion of future breaker.

K. Provide UL-listed shunt trip attachment 120 V coil with 480 V to 120 V fused primary and secondary control power transformer where shown on Drawings.

L. Main bus bars shall be copper, sized as required by UL standards to limit temperature rise on current-carrying parts to 50°C above ambient 40°C maximum. This shall include phase, ground and neutral buses.

M. Provide ½” spacers for panelboards mounted at exterior walls below grade to establish ½” air space behind panel.

N. Provide typed panel directions that show use of each circuit and electrical characteristics of panelboard. Directory shall be mounted inside of each panelboard within clear plastic cover.

2.14 FIRE ALARM SYSTEM

A. Scope: The Electrical Contractor shall provide new devices and associated fire alarm cabling to supplement the existing addressable Simplex Addressable Fire Alarm System. The work
covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and the performance of all operations in connection with the installation of a complete Fire Alarm System as shown on the drawings and as herein specified.

1. Equipment shall meet requirements of Amherst Fire Department and State Fire Marshall. Installation shall meet FM requirements and following NFPA standards:
   b. National Electrical Code 70.
   c. International Fire Alarm Code
   d. NFPA 72
   e. ADA

2. Submit shop drawings as specified. Shop drawings shall include terminal-to-terminal wiring schematics, exact color coding, location and function of each device and appropriate specification data sheets.

B. Quality Assurance:

1. Each and every item of the Fire Alarm System shall be listed as a product under the appropriate category of Underwriter's Laboratories (UL) and shall bear the UL label.

C. Work Included:

1. The electrical contractor shall provide new fire alarm devices and wiring required including batteries, address loops, amplifiers, etc. to provide a complete and operational system, to supplement the existing system. Contractor shall coordinate with Simplex for all additional equipment required to the existing fire alarm control panels, terminal boxes, etc. to provide a complete and operational system.

2. The system shall include, but not be limited to, all control equipment, necessary power supplies, analog addressable initiating devices, audible and visual indicating appliances, conduit, wiring and all other accessories necessary to provide a complete and operational system as herein specified.

3. The electrical contractor shall carry all costs for existing fire alarm control panel and annunciator to be reprogrammed to incorporate new devices. The Electrical Contractor shall coordinate reprogramming with the manufacturer’s representative, Owner and the Architect. EC must verify room names and numbers with the owner and fire department prior to programming the system.
4. Existing smoke detectors in corridor ceilings that are being removed due to new sprinkler lines being installed, shall be temporarily removed, and reinstalled in the same location. This contractor shall be responsible for cutting into new ceiling tiles for the new installation of the smoke detectors.

D. Submittals: Upon receipt of the notification to proceed, the contractor shall furnish the required number of submittals, as indicated elsewhere in this specification. At least one submittal shall include ORIGINAL, MANUFACTURERS’ specification sheets. Submittals shall include at least the following:

1. A complete list of all equipment including descriptions, computer generated drawings and computer generated current drain calculations in both supervisory and alarm modes of operation. The submittals shall be presented in a bound folder. Loose specification sheets will not be acceptable.

2. A system riser diagram indicating every device in the system and how they are interconnected.

3. Component wiring diagrams and how they interconnect with the risers.

4. An address directory indicating each device address, the model number of the device, the description that will appear on the display when the device is active, the type of device and what event(s) will occur when the device is in alarm condition. Each device shall be listed with the above information, typical or grouped devices will not be acceptable. This address directory may be printed directly on the riser diagram.

5. It is the intent of this specification that the submittal package, in conjunction with the manufacturer’s installation manual, will be utilized by the installing contractor as the system’s installation manual.

E. Warranty And Final Test

1. The contractor shall warrant all equipment and wiring free from mechanical and electrical defects for one year from the date of final system acceptance.

2. A complete, 100% test shall be performed per Chapter 7 of the National Fire Alarm Code. The “Report of Completion” and the “Inspection and Testing Form” shall be completed and copies furnished to the architect and the owner.

F. Manual fire alarm station: Provide addressable Simplex 4099 series semi-flush, non-coded, double-action. Downward pull of lever shall actuate positive switch. Station shall remain actuated until reset. Key shall be used for drill and test purposes. “All devices shall be keyed alike. EC shall coordinate keys with fire department.

G. Thermal Detectors: Provide following detectors:

1. 135°F Fixed Temperature Simplex 4098 series.
H. System Smoke Detectors:

1. Provide addressable photo-electric smoke detectors, Simplex 4098 series.

2. Light source for detection chamber shall be solid-state light emitting diode (LED) with half-life in excess of 30 years.

3. Detectors shall have SPST N/O alarm contact and DPDT auxiliary contact to provide two separate auxiliary switching circuits, alarm latch circuit, ALARM lamp and tamper/reset switch.

4. Detector shall have functional test circuit capable of simulating maximum acceptable amount of products of combustion for alarm. Test circuit shall provide individual local test of detector and shall not require generation of actual smoke within building.

5. Detector shall detect smoke at 1% light obscuration. Light source shall be pulsed infrared LED at 24 V DC. Internal detector circuits shall be shielded against electrical interference. Detector stability shall be unaffected by high air velocity at any sensitivity setting.

I. Audible/Visual Alarm Signals

1. Provide Simplex audio/visual units compatible with the existing fire alarm control panel. Units shall consist of 24V strobe in clear lens rectangular dome, labeled in red FIRE, and audio component rated for 24V DC supervised operation. All devices shall meet the requirements of ADA and shall be synchronized. Verify audible/visual devices are compatible with the existing fire alarm control panel, prior to purchasing them.

2. Assembly shall be mounted on red lexan frame, on surface or flush wall box.

J. Wiring

1. Wiring shall be SLC Intelligent Loop wiring and meet requirements of the NEC, Article 760, Fire Protective Systems for Building Fire Alarm Systems, and as shown on Drawings. Wires for local fire alarm system shall be color-coded to correspond with manufacturers wiring schematics submitted with shop drawings, sized as recommended by manufacturer of fire alarm system and installed in conduit. Combined cross sectional area of conductors or cables shall not exceed percentage of fill specified in Table 1, Chapter 9 of NEC. Conduit size shall be coordinated with fire alarm manufacturer.

2. Fire alarm system wires in junction boxes shall be permanently tagged and identified. Each junction box capacity shall be 40% greater than that required for associated fire alarm system wires. Each junction box shall be painted fire alarm red and identified with white markings FIRE ALARM SYSTEM.

3. Provide, in accordance with manufacturer’s instructions, wiring, conduit and outlet boxes required for erection of complete system as specified and as shown on drawings.
4. Make connections within control equipment and devices with T&B Stakon spade terminals. Wiring within control equipment shall be secured with T&B Ty-raps and placed in wiring gutters.

5. Wiring shall be in conduit of same approved type as used for electric light and power wiring. Wires shall be at least #14 AWG, with type THWN insulation.

6. Final connections between equipment and wiring system shall be made under supervision of manufacturer’s representative.

7. Fire alarm equipment shall be flush to surface where possible. All locations where this is not possible shall be approved in writing by the Architect.

K. Fire Alarm Inspection and Testing Agreement

1. Provide fire alarm inspection and testing agreement in accordance with Owner’s requirements.

2.15 GENERAL

A. All devices shall comply with ANSI/TIA/EIA 568-B.1, B.2, B.3 Standard.

B. The wiring configuration for all telecommunications RJ45 jacks & devices shall be T568B.

C. Manufacturer and part numbers are indicated throughout the specification to establish quality and performance characteristics and strict minimum performance requirements of individual products and the precise matching of tested and proven system combinations. Any deviation from the specified components/manufacturers shall be noted as such on the product submittal. Any submittal deviating from the specification will require documentation proving equivalent performance to the specified products/system combinations. Final acceptance testing and warranties must strictly equal or exceed the performance specifications detailed herein.

D. UTP Station Cables: Provide and install a Category 6 manufacturer certified compliant horizontal cabling and hardware system from outlet jacks to cable riser terminal blocks and through to switch ports, inclusive, and as specified below for each Data/Phone outlet shown on Contract Drawings

E. The Category 6 Horizontal Cabling System shall have a 20 year manufacturer's repair or replacement warranty equal or better than the 20 year ADC Warranty.

2.16 COMMUNICATIONS

A. Voice/Data Faceplates

B. Single gang, 4 port white color faceplate shall be ADC P/N 6644 1154-01

MODULAR INSERTS (RJ45 JACKS)
C. Single modular data inserts (RJ45 jacks) shall be 8 position, 8 conductor, T568B, Category 6, ADC P/N KM8. All positions on faceplate shall be blue ADC product #6830 1 830-06.

D. Provide blank jack inserts as required. Color shall match that of the outlet wall plates. ADC Product #6645 1 160 01 (in the case of white wallplate)

HORIZONTAL CABLE

E. Station cable shall be Category 6, 24 AWG, 4-pair, UTP, tested to 550 MHz with riser rated jacket. All cable shall meet Category 6 Standards. No minimally compliant cable will be accepted. Cable shall be marked suitable for its purpose. Cables shall have blue jackets, ADC Product #TN6SR-BL.

FIBER OPTIC BACKBONE CABLE

F. General

1. The cable must be manufactured from Corning glass.

MANUFACTURERS

G. Acceptable Manufacturers:

1. Corning
2. ADC

H. Indoor Riser Fiber:

1. All fiber optic cables shall be UL listed OFNR rated with fibers individually wrapped in a color-coded 900 micron tight buffer. They shall be 12SM fiber manufactured with Corning glass.

I. Associated Products

J. Innerduct: All fiber cables shall be installed in innerduct – exceptions noted.

1. Provide 1” innerduct with pull string for fiber installation.
2. Innerduct shall be rated for indoor use.
3. Provide one (1) Century 48 port Fiber Enclosures, with UMass standard key/locking:
   a. Century part # FCC48STUMLS48- Contact at Century is Henry Bullard. (No substitutes) Enclosure loaded with 48 SM bulkheads. (To be installed in Room 32.)
K. Connectors:
   1. ST type, Corning pigtail type, in splice tray.
   2. New IT rooms get LC type w/ Corning pigtail, placed into Corning CCH splice cassette.

STATION CABLE TERMINATION BLOCKS IN WIRING CLOSETS

L. Provide sufficient 48 port patch panels, patch panel must be: TE PP48PNPT to meet cabling requirements plus approximately 20% spare capacity. Patch panels shall be mounted equipment rack. Provide (1) rear patch panel wire manager per 48 port patch panel CPI p/n: TS1025910.

M. Provide approved vertical and horizontal cable management for the patch panels TE 558329-1.

N. Provide split D-rings on portions of the backboard where cross-wiring and patch cables otherwise have no cable management and support; spacing intervals approx. 12”.

EQUIPMENT RACKS IN NEW NETWORK ROOMS

O. Floor mounted racks shall be 7'H x 19"W, manufactured by ADC, P/N 6652 2 550-19 or approved equal.

P. Vertical wire management shall be double sided, finger cable guides in front, cable guide rings in back CPI p/n: 30162-703.

Q. Each rack shall have 2 sets of double sided shelves installed above each other. CPI p/n 40751-X19.

R. Each rack shall have a fiber patch panel termination unit installed as the topmost item. That rack mount enclosure shall be a 1-unit high, Corning-C CCH-01U with one CCH-CS cassette for each 12-port LC Corning CCH-CP12-A9 adapter. Copper voice feeder is to be terminated on rack mount 110 block TE p/n: 558635-1.

CABLE SUPPORTS AND MANAGEMENT

S. Cable hangers shall be open-top cable supports (J-Hooks), 2” diameter loop, Caddy manufactured or approved equal.

T. Tri-Hook cable hangers shall be Caddy manufactured or approved equal.

U. Tri-Hook system support bar shall be Caddy manufactured or approved equal.

V. The contractor shall provide the specified manufacturers or approved equal.

W. J-Hook supports shall be installed in accordance with the manufacturer recommendations and located at intervals such that the cables do not rest on ceiling tile or grid at any point along the distance <=4 foot intervals.
X. Cable management straps shall be of the velcro variety, ADC P/N VCM-25-06-1 (6 inch) or P/N VCM-25-12-1 (12 inch) or approved equal.

Cable Runway/Ladder Rack System

Y. 12” Cable Runway product shall be Homaco manufactured, P/N TR10-12 or Chatsworth or approved equal.

Z. Butt splice kit shall be Homaco, manufactured, P/N PA20-12-7H or approved equal.

AA. Wall angle support bracket shall be Homaco manufactured, P/N P1282YOH or approved equal.

BB. Junction splice kit shall be Homaco manufactured, P/N JP0912 or approved equal.

CC. Threaded ceiling kit shall be Homaco manufactured, P/N P987651H or approved equal.

DD. Grounding kit shall be Homaco P/N GS-8 or approved equal.

Cable Runway System within corridor ceilings:

EE. Provide Dual Pocket “Snake Tray” system, product shall be Snake Tray manufactured, 201 series or Chatsworth or approved equal.

2.17 FIRESTOPPING

A. Related Documents

1. Coordinate work of this Section with the work of the following Sections and Divisions to properly execute the work in order to maintain the hourly ratings of the walls and floors where firestopping and smoke-seals are applied.

   a. Section 017329- cutting and patching

B. Description

1. This SECTION describes the requirements for furnishing and installing firestopping for fire-related construction. This includes:

   a. All openings in fire-rated floor and wall assemblies, both blank (empty) and those accommodating penetrating items such as cable conduits, pipes, ducts, cable trays, etc.

   b. Openings at each floor level in shafts or stairwells.

   c. Joints in rated walls and floors between similar and dissimilar construction materials.

C. Quality Assurance
1. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local Building code and as tested by nationally accepted test agencies per ASTM-E-814 or UL 1479 fire tests, ASTM E-1966 or UL 2079 for construction joints. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating, when required by code authority shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with minimum positive pressure differential of 0.01 inches of water column.

2. Firestopping material shall be free of asbestos, PCBs, ethylene glycol, and lead.

3. Do not use any product containing solvents or that requires hazardous waste disposal.

4. Firestopping shall be performed by a contractor trained or approved by firestop manufacturer.

5. Equipment used shall be in accordance with firestop manufacturer’s written installation instructions.


D. Product Delivery, Storage and Handling

1. Deliver material in the manufacturer’s original, unopened containers or packages with manufacturers name, product identification, lot numbers, UL-labels, and mixing installation instructions, as applicable.

2. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturers.

3. All Firestop materials shall be installed prior to expiration of shelf life.

E. Sequencing

1. Coordinate this work as required with work of other trades.

2. Firestopping shall precede gypsum board finishing.

F. Products

1. Acceptable Manufacturers:
   a. Bio Fireshield ™ (whose products are listed as a standard).
   b. RectorSeal ® Metacaulk ®
   c. 3M
2. Firestop Motars:
   a. K-10+ Firestop Mortar.
   b. Metacaulk ® Mortar.

3. Firestop Sealants and Caulks:
   a. Bio Fireshield ™ Biotherm ™ 100 and Biotherm ™ 200 Firestop Sealants.
   b. Bio Fireshield ™ BIOSTOP ™ 500+, 750, and BF150+ Intumescent Firestop Caulk.
   c. Metacaulk ®, 950, 835+, 1000, 1200, MC150+ & Intumescent Firestop Caulks.
   d. 3M CP25WB+.

4. Firestop Putty:
   a. 3M MPS-2 Moldable Putty Stix.
   b. 3M MMP-4S Moldable Putty Pads.
   c. Metacaulk ® Putty & Putty Pads
   d. Bio Fireshield ™ BIOSTOP ™ Moldable Putty & Putty Pads

5. Firestop Collars:
   a. BIOSTOP ™ Plastic Pipe Collar.
   b. Metacaulk ® Plastic Pipe Collar
   c. 3M PPD

6. Intumescent Fire Retardant Firestop Mastic- Spray, Brush, or Towel applied.
   a. Metacaulk ® 1100 Firestop Mastic
   b. Bio Fireshield ™ 700 Firestop Mastic.

7. Non-Intumescent Firestop Spray Sealant
   a. BIOSTOP ™ 750 Firestop Spray
   b. Metacaulk ® 1200 Firestop Spray
   c. 3M Firedam Spray
8. Wrap Strips:
   a. 3M FS-195 Wrap Strip
   b. Bio Fireshield™ BIOSTOP™ Intumescent Wrap Strips
   c. Metacaulk® Intumescent Wrap Strips

9. Firestop Pillows
   a. Metacaulk® PILLOWS
   b. BIOSTOP™ Firestop PILLOWS
   c. 3M Firestop Pillows

10. Wall Opening Protective Materials
    a. LECTRA-STOP™ Fire Rated Electrical Box Inserts, by BIO FIRESHIELD™
    b. BIOSTOP™ Fire Rated Putty Pads
    c. 3M Moldable Putty Pads
    d. Metacaulk® BOX GUARD™ Fire Rated Electrical Box Inserts, By RectorSeal Corporation
    e. Metacaulk® Putty Pads
    f. Metacaulk® Cover Guard™
    g. Bio Fireshield™ Firestopping Gasket

2.18 CABLE TRAY SYSTEMS
   A. Provide snake tray systems, for IDF rooms and distribution throughout the building.

PART 3 - EXECUTION
3.1 MATERIALS AND WORKMANSHIP
   A. Work shall be executed in workmanlike manner and shall present neat, rectilinear and mechanical appearance when completed. Maintain maximum headroom at all time. Do not run pipes and ducts exposed unless shown exposed on drawings. Material and equipment shall be new and installed according to manufacturer’s recommended best practice to that completed installation shall operate safely and efficiently.
3.2 CONTINUITY OF SERVICES

A. Do not interrupt existing services without Owner’s and Architect’s approvals; refer to Section 015000 for service interruption request requirements. Coordinate temporary power as may be required by Section 020700. The EC is responsible to secure temporary power prior to the start of the project.

3.3 SPECIAL RESPONSIBILITIES

A. Coordinate work of this Section with work of other Sections.
   1. Provide information about items furnished under this Section to be installed under other Sections, as necessary.
   2. Obtain detailed information from manufacturers of equipment provided under this Section as to proper methods of installation.
   3. Obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or by Owner.
   4. Keep fully informed of shape, size and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.

3.4 TESTING, INSPECTION AND CLEANING

A. Test and inspect work provided under this Section as required by Contract Documents, codes, standards and authorities that have jurisdiction, to satisfaction of Architect. Notify Architect and authorities at least 48 hours before testing or inspection. Do not cover work before testing or inspection.

B. Furnish Architect with certificates of testing and inspection for electrical systems, indicating approval of authorities that have jurisdiction and conformance with requirements of Contract Documents.

C. Test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required. Insulation resistance between conductors and grounds for secondary distributions systems shall meet NEC requirements.

D. Verify and correct as necessary: voltages, tap settings, trip settings and phasing on equipment from secondary distribution system to points of use. Test secondary voltages at bus in main switchboard, at panelboards, and at other locations on distributions as necessary. Test secondary voltages under no-load and full-load conditions.

E. Test lighting fixtures with specified lamps in place for 10 hours; check fixtures in sections. Do not operate lamps other than testing before final inspection by Architect. Replace lamps that fail within 90 days after acceptance by Architect within Contract Price.
F. Provide necessary testing equipment and testing.

G. Failure or defects in workmanship or materials revealed by tests or inspection shall be corrected promptly and retested. Replace defective material.

H. Panelboard interiors shall be cleaned and vacuumed. Equipment with damage to painted finish shall be repaired to Architect’s satisfaction.

I. Equipment
   1. After completion of this project, clean the exterior surface of equipment included in this section, including concrete residue.

3.5 NAMEPLATES

A. Provide nameplates in or on existing switchboard panelboards, junction boxes and cabinets, and for special purpose switches, motor disconnect switches furnished or installed under this Section. Nameplates shall designate equipment controlled and function.

B. Nameplates shall be laminated black bakelite with ¼” high white recessed letters. Nameplates shall be securely attached to the equipment with galvanized screws. Adhesives or cements shall not be used.

C. Nameplates for receptacles shall be provided as shown on details on the contract drawings.

3.6 WIRING METHODS

A. Install wire and cable in approved raceways as specified and as approved by authorities that have jurisdiction. Surface metal raceways shall not be used unless explicitly specified and shown on Drawings. Do not use surface raceways on floor. Do not use armored cable except as approved by local code for lighting and receptacle circuits in suspended ceilings and stud-wall partitions. Homeruns for lighting circuits shall be 3-phase, 4-wire run in conduit.

B. Wire from point of service connection to receptacles, lighting fixtures, devices, equipment, outlets for future extension, and other electrical apparatus as shown on Drawings. Provide slack wire for connections. Tape ends of wires and provide blank covers for outlet boxes designated for future use.

C. Conductors #10 and smaller in branch circuit panelboards, signal cables, signal control boards, switchboards and motor control centers shall be bundled. Conductors larger than #10 in switchboards, motor control centers and pull boxes shall be cabled in individual circuits.

D. Two or more conduits installed instead of single conduit shall contain duplicate conductors, including neutrals and ground conductors where required; total capacity of duplicate conductors shall be at least equal to capacity of conductors replaced.

E. Follow homerun circuit numbers shown on Drawings to connect circuits to panelboards. Where homerun circuit numbers are not shown on Drawings, divide similar types of connected loads.
among phase busses so that currents are approximately equal in normal usage. Connect each branch circuit homerun with two or more circuits and common neutral to circuit breaker or switch in three-wire or four-wire branch circuit panelboard so that no two circuits are fed from same bus. Where panelboard cabinets are recessed, provide conduits with sufficient capacity for future conductors for spare branch circuit protective devices and spaces in panelboard; stub up concealed to junction box. Provide extensions above ceiling.

F. Electrical metallic tubing may be used generally, if approved by local codes, for lighting fixture and receptacle circuits, telephone, inter-communications, signal and instrumentation circuits, and for control circuits. EMT may be used generally, if approved by authorities, in masonry walls, above hung ceilings, in equipment rooms, in mechanical and electrical chases and closets, in exposed locations along ceilings or walls above normal traffic level and where not subject to accidental damage or abuse. Do not run EMT exposed below 8 feet above finished floor. Conduit below 8'-0" AFF exposed shall be rigid steel.

G. Install connectors and couplings as recommended by manufacturers. Compression fittings shall not be used with rigid steel, intermediate metallic or aluminum conduit. Set screw fittings shall not be used with rigid aluminum conduit and shall not be used for other applications, unless specified and approved by Architect. If set-screw connectors are used, tighten to imbed screws in conduit.

H. Provide flexible conduits for connections to electrical equipment and to equipment furnished under Divisions 14 and 15 that are subject to movement, vibration or misalignment; where available space dictates; and where noise transmission must be eliminated or reduced. Flexible conduit shall be liquid-tight under the following conditions:

1. Exterior locations
2. Moisture or humidity-laden atmospheres
3. Corrosive atmospheres
4. Where wash-down operations are possible
5. Where seepage or dripping of oil, grease or water is possible

I. Run concealed conduit and EMT in as direct lines as possible with minimum number of bends of longest possible radius. Run exposed conduit and EMT parallel to or at right angles to building lines. Ends shall be free from dents or flattening.

J. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to outlets. Conduit shall enter and be secured to cabinet, junction box, pull box or outlet box with locknut outside and bushing inside, or with liquid-tight, threaded, self-locking, cold-weld wedge adapter. Provide additional locknut for rigid conduit and wrench-tighten locknut for EMT or flexible conduit where circuit voltage exceeds 250 V. Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into tapped connections. Vertical conduit runs that terminate in bottoms of wall boxes or cabinets shall be protected from entrance of foreign material before installation of conductors.
K. Size rigid steel conduit, EMT and flexible metallic conduit as required by NEC except as specified or shown on Drawings otherwise. Unless shown otherwise on Drawings, telephone conduits shall be at least 1”.

L. Check raceway sizes to determine that green equipment ground conductor fits in same raceway with phase and neutral conductors to meet NEC percentage of fill requirements. Increase duct, conduit, tubing, and raceway sizes shown or specified as required to accommodate conductors.

M. Unless specified or shown on Drawings otherwise, install conduit and EMT concealed. Unless specified or shown otherwise, conduit and EMT may be run exposed on unfinished walls and unfurred basement ceilings and in unfinished penthouses, attics and roof spaces. Provide stand-off clips for conduits on exterior masonry walls.

N. Install conduit systems complete before drawing in conductors. Blow through and swab after plaster is finished and dry, and before conductors are installed.

O. Expansion/Deflection Fittings: Conduit buried or secured rigidly on opposite sides of building expansion joints and long runs of exposed conduit subject to stress shall have expansion fittings. Fittings shall safely deflect and expand to twice distance of structural movement.

P. Sealing Fittings: Threaded sealing fittings for rigid steel conduits shall be zinc-or cadmium-coated, cast or malleable iron; sealing fittings for aluminum conduit shall be threaded cast aluminum. Fittings that prevent passage of water vapor shall be continuous drain.

1. Install and seal fittings as required by manufacturer’s recommendations. In concealed work, install fittings in flush steel box with blank cover plate.

2. Install sealing fittings at following points, and elsewhere as shown:
   a. Where conduits enter or leave hazardous areas equipped with explosion-proof lighting fixtures, switches, receptacles and other electrical devices.
   b. Where conduits pass from warm to cold locations.
   c. Where required by NEC.

3. Secure conduit system as required by NEC.

Q. Provide inserts, hangers, anchors and steel supports as necessary.

3.7 INSTALLATION OF LIGHT FIXTURES

A. Coordinate installation of fixtures with installation of ceiling materials and suspension systems.

B. Do not install fixtures until work of other trades that may damage fixtures is completed.

C. Investigate lighting fixture locations and supports to ensure that no interference exists with hangers, ducts, sprinklers, pipes and other equipment.
D. Provide plaster frames for fixtures recessed in gypsum board or plaster ceiling.

E. Do not suspend or support lighting fixtures or safety chains from hung ceiling conduit or duct. Support fixtures with threaded rod from structural members only.

F. Provide unistrut below ducts where fixture locations coincide with duct runs. Provide threaded rods to support unistrut.

G. Luminaries shall be compatible with flexible wiring system.

H. Support surface-mounted luminaries at least two concealed points to prevent rotation.

I. Mounting height of suspended or wall-mounted luminaries shall be shown on Drawings.

J. Locate ceiling-mounted fixtures as shown on reflected ceiling plans. Locate wall-and floor-mounted fixtures as shown on Electrical Drawings.

K. Provide marking system to indicate fixtures with emergency ballasts.

3.8 GROUNDING

A. Provide equipment grounding system as shown on Drawings. Equipment grounding system shall be designated so metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits operate continuously at ground potential and provide low impedance path for possible ground fault currents.

B. System shall meet NEC requirements, modified as shown on Drawings and as specified.

C. Provide separate green insulated equipment grounding conductor for each single or three-phase feeder and each branch circuit. Install grounding conductor in common conduit with related phase or neutral conductors, or both. Parallel feeders installed in more than one raceway shall have individual full size green insulated equipment ground conductors.

D. Determine numbers and sizes of screw terminals for equipment grounding bars in panelboards and other electrical equipment. Provide screw terminals for active circuits, spares and spaces.

E. Provide green insulated grounding conductor in same raceway with associated phase conductors, as follows:

1. From green ground terminals or receptacles to green 10-32 washer-in-head outlet box machine screw. (Receptacles with special cast boxes and factory designed and approved ground path do not require separate ground jumper.)

2. From green 10-32 washer-in-head machine screw in ceiling outlet box or junction box through flexible metallic conduit to ground terminal in fixture.
3. From green 10-32 washer-in-head machine screw in ceiling outlet box or junction box through flexible metallic conduit to green 10-32 washer-in-head machine screw in switch outlet box in movable partitions.

4. From green 10-32 washer-in-head machine screw in junction box or disconnect switch through flexible metallic conduit to ground terminal in connection box mounted on single phase fractional horsepower motor.

5. From equipment ground bus in motor control center through conduit and flexible metallic conduit to ground terminal in connection box mounted on three-phase motor. Ground conductor motors with separate starters and disconnect services shall originate at ground bar in panelboard and shall be bonded to each starter and disconnect device enclosure.

6. From switchgear equipment ground bus to panelboard equipment ground bus.

7. From switchgear equipment ground bar to equipment grounding bar on busway.

3.9 GENERAL

A. All devices shall comply with ANSI/TIA/ EIA 568-B.1, B.2, B.3 Standard.

B. All telecommunication outlets shall be T568B wiring configuration.

C. All termination equipment mounted on walls in Tel/data rooms shall be mounted on ¾” AC plywood backboard with the “A” side as outward surface.

D. Backboards shall be painted sky blue with two coats of fire-retardant paint, Sherwin Williams “Freshwater” # 6774.

E. Provide proposed layout diagrams for review and approval by OIT Telcom engineer prior to installing racks, patch panels and termination hardware.

F. Coordinate all work with all contract documents including but not limited to:

G. Architectural floor plans and equipment layouts.

H. Electrical contract documents.

I. Mechanical equipment.

J. Coordinate all work with all on-site contractors including, but not limited to:

K. Other contractors and consultants.

L. Electrical Contractor.

M. Refer to Electrical Plans for pathways including sleeves, conduits, cable tray to be utilized by this contractor.
N. Refer to Telecommunications Plans for additional information.

O. Cooperate and coordinate with work of other sections in executing work of this section.

P. Perform work so that progress of entire project including work of other sections is not interfered with or delayed. Obtain detailed installation information from all manufacturers of equipment provided under other sections.

Q. Provide information as requested on items furnished under this section which shall be installed under other sections.

R. Materials and Workmanship

S. Work shall be executed in workmanlike manner and shall be neat, plum, parallel to the building structure, perpendicular to all electronics and associated cabling and neat in appearance when completed. All work shall adhere to the standards as set forth in this specification. Maintain maximum headroom at all times. Do not run work exposed unless shown exposed on drawings.

T. Material and equipment shall be new and installed according to manufacturer's recommended best practices so that completed installation shall operate safely and efficiently, and be neatly installed.

U. This contractor owns the greater quantity and better quality where conflicts exist.

V. Continuity of Services: Do not interrupt existing services. Existing services shall remain operational at all times. If the existing services need to be disrupted for any reason the contractor shall contact the Owner (representative to be announced at a later date) and schedule the aforementioned shutdown. The contractor shall schedule the shutdown with the Owner 48 hours in advance.

W. Any reference to telecommunication outlet shall indicate faceplate, modular insert, termination, cabling, labeling, testing, etc.

X. All cabling shall be terminated at both ends unless noted otherwise.

Y. To minimize EMI interference, maintain maximum separation of tel/data cabling from power wiring and conduits wherever feasible; 6” separation generally acceptable. Maintain 12” separation of tel/data cabling from fluro ballasts and wherever feasible.

3.10 FACE PLATES

A. Provide all face plates for telecommunications outlets.

B. Coordinate with the Electrical Contractor for mounting compatibility.

C. Refer to the Construction E-Series contract drawings for the exact quantity and location of the telecommunications outlets.
D. Refer to the Plans for configuration of faceplates.

3.11 MODULAR INSERTS
A. Provide all modular inserts, providing one modular insert at each end.
B. Refer to telecommunications details for the exact quantity and orientation of modular inserts within each telecommunications faceplate.
C. All telecommunication jacks shall be T568B wiring configuration.

3.12 HORIZONTAL CABLE
A. With the sole exception of cables in wiring closets and network rooms, no tel/data cables shall run exposed. Above drop ceilings they shall be secured on Cat 6 compatible J-hooks. In exposed locations some suitable surface raceway system shall be required. Coordinated/approved by the Architect and Designer.
B. Provide horizontal voice/data cable from work stations shown on Plans to the nearest IDF.
C. Provide one (1) horizontal Category cable from each modular insert to its corresponding patch panel jack. The patch panel termination position will define the Cable ID#. Do not skip over or leave blank positions in the patch panels.
D. All four pairs of each horizontal Category 6 cable shall be terminated at both ends.
E. One end of the horizontal cable shall be terminated in an 8 position, 8 conductor modular insert at the telecommunication outlet.
F. The other end of the horizontal cable shall be terminated at a patch panel.
G. Additional locations not shown on typical room drawings.
H. Provide two 4-pair cables in the elevator machine room, one terminated on a screw-type terminal strip in a 4” square box, the other terminated in a second box/faceplate using typical RJ45 configuration. (NOTE: This service deserves special attention since it often ends up being a critical path for elevator testing and use.)
I. Install wire and cable in approved/provided raceways and cable tray as specified and as approved by the authorities that have jurisdiction.
J. Cable Pulling: Pulling Tension: Maximum pulling tensions for 4-pair horizontal UTP cable shall not exceed 110N (25 lbf).
K. Maintain cable twist to within ½” of the main point of Insulation Displacement Contact (IDC).
L. When stripping cable for termination remove only a minimum amount (i.e., as little as possible) of cable jacket insulation. (Refer to Manufacturer’s Cat 6 specifications)
M. Additional cable slack (service loop) shall be provided at both ends for maintenance or future cabling system changes:

N. Telecommunications Outlet = 2 feet; to be left available & neatly secured, above drop ceilings near the top of each stub up from outlets.

O. Splices are not permitted for any horizontal cabling.

P. No horizontal cable run shall exceed 295 feet (90 m). (Including Slack)

3.13 WIRELESS ACCESS POINTS (WAP’S)

A. Coordinate WAP outlet box locations as follows. They shall not be mounted closer than twenty-four inches to electrical or electronic devices or large metal objects. Examples of electrical or electronic devices include fire alarm system sensors, permanent fluorescent lighting, and electrical panels. Examples of large metal objects include sprinkler piping and heads, steel columns, steam or hot-water heat piping, sheet metal ductwork, and plumbing piping.

B. The cable serving each WAP must have a minimum of 8 inches of slack available in the wall box after termination.

C. Each WAP outlet box shall be fed with two green ADC Cat 6A cables with associated green ADC KM8 jacks. (All other station cable shall be blue jacketed.)

D. The Cat 6 cable feeding each AP outlet shall be terminated using a male RJ45 plug with strain relief. RJ45 male plug shall be Platinum Tools part number 100010C Category 6 rated with blue Platinum Tools strain relief part number 100030B to remain consistent with University standards and practices. Crimping shall be performed with Platinum Tools part number 100044 EZ-RJPRO crimp tool.

E. The cable jacket shall be labeled with assigned jack number approximately 6 inches from terminated end of cable.

3.14 Fiber optic backbone cable

A. Provide inside plant fiber cable as detailed in the riser diagram.

3.15 FIBER OPTIC TERMINATION HARDWARE

A. Provide ST termination hardware mounted at each ends of the fiber runs.

B. Provide LC type termination hardware in the new IT rooms.

C. All fiber optic strands shall be terminated, tested, labeled, and installed in fiber optic termination hardware and enclosures.

D. Refer to Plans, for fiber patch panel and fiber enclosure locations and details.
3.16 EQUIPMENT RACKS

A. Each rack shall house equipment and devices of the following types in various quantities:
   1. Fiber termination units.
   2. Vertical cable management.

B. Provide Equipment Racks; refer to Plans for quantities and location.

C. Provide two double-sided vertical wire managers per rack with finger cable guides in front and cable guide rings in back CPI p/n: 30162-703.

D. All racks shall be secured to the floor using the factory recommended hardware and installation practices.

E. All racks shall be properly grounded, conforming to ANSI/TIA/EIA 607, NEC and all related grounding standards and codes.

F. Install cable racks in accordance with ANSI/NFPA 70, Article 318 requirements and as specified herein.

G. Ladder rack in each Tel/Data closet shall be secured to the top of the equipment rack. This is to assist with cable transition into the rack. In addition, this shall keep the rack from any swaying. Racks shall not sway more than ¼ inch when leaned against.

3.17 CABLE SUPPORTS AND MANAGEMENT

A. Generally, cable pathways are provided by others. The pathways shall be parallel to building lines and shall sweep/turn at 90 degree angles maintaining minimum bend radius for cable and will comply with the guidelines and recommendations outlined in ANSI/TIA/EIA-568-B.1, B.2, B.3 and ANSI/TIA/EIA-569-A.

B. Provide cable and supports as required. All cables shall be supported.

C. Where cable tray, ladder rack or conduit are not provided for support of the telecommunication cables, provide J-Hook cable supports, at 4 foot intervals, with the following exception.

D. Where fiber cable (such as risers) is to be installed inside building and not supported in conduit or on ladder rack, install in 1” innerduct and support on J-hooks at 3 ft max interval spacing.

E. Cable supports shall be mounted independently from the building structure. Cables shall not be supported from the ceiling structure, mechanical, electrical, fire protection or plumbing devices.

F. Where metal conduit is provided by others for use by the telecommunications contractor, provide each end of the conduit with plastic grommets for cable sheath protection.
G. Provide all strain relief and adequate support for purpose of maintaining bend radius and providing additional protection/support of exposed cables and with particular attention to fiber cables and fragile fiber patch cords. Run fiber cables in innerduct or segregated in finger duct.

H. At all equipment racks, provide velcro straps at 1 foot intervals for support of cables.

I. Voice and Data Infrastructure

J. Provide management and support as required. Refer to telecommunications drawings and details for location and quantity of horizontal cable management.

K. Provide vertical management on each equipment rack.

3.18 CABLE RUNWAY/LADDER RACK SYSTEM

A. Provide 12" ladder rack in Tel/Data closets.

B. Refer to Plans for details.

3.19 LABELING AND IDENTIFICATION

A. All labels shall be clearly printed on clear or opaque tape and meet the following requirements:
   1. The font shall be approximately 1/8" in height, block characters and clearly legible.
   2. The text and color shall contrast with the label background (e.g. black on white).
   3. Hand written labels are not acceptable.
   4. All labeling material shall meet the minimum flame rating requirements.

B. Provide labeling as required.

C. Provide description strips in the face plate/outlet and/or patch panels. Patch panel(s) layout per system services shall exhibit all station outlet numbers in sequential order. Each faceplate/outlet shall have a separate number. Office numbers shall not be used as cable numbers.

D. All patch cords in IT closets shall be labelled to UM IT standards.

E. Designation strips shall be securely attached to the equipment.

F. All cables shall be clearly labeled at both ends. All termination points shall be clearly labeled.

G. Faceplates shall be labeled at top with IDF#, faceplate# and cable# in format provided by UMass. If the faceplate has more than one cable, bottom position label is also required.
H. UMass Telcom Dept will provide labeling specifics for all faceplates, cables and T/D Room terminations.

I. Provide warning tags at each location where fiber optic cable is exposed to human intrusion. These tags shall be YELLOW or ORANGE and shall contain the warning: "CAUTION FIBER OPTIC CABLE". The text shall be permanent, black, block characters and be at least 3/16" high. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not more then five feet (5'-0''). Any section of exposed cable that is less than five feet (5'-0'') in length shall have at least one warning tag affixed.

J. Provide fiber optic warning tags at all fiber optic patch panels ie the laser hazard to vision.

3.20 TESTING, INSPECTION AND CLEANING

A. All cables (UTP and fiber) shall be tested as noted below.

B. Provide an electronic copy of all test results in some easily opened non-proprietary format (like pdf files say). Hand written test results will not be accepted.

C. All testing shall be completed after all telecommunication outlets have been secured in their final position and are properly labeled per this specification.

D. Building must be operational (i.e. building lighting and power must be energized).

E. Provide the Owner with the following documentation and test results for all cables. Testing and Documentation shall include, but not be limited to:

1. Fiber Optic Cables

   a. Using an optical time domain reflectometer (OTDR), test and record the quality of each cable while still on the reel, prior to installation, to verify that no damage has occurred during shipment. This test needs to be done in one direction only.

   b. Using an optical power meter, measure end-to-end attenuation for all installed cables, including: all connectors, the terminated fiber itself; all connectors, and patch panels. The total loss shall be measured and reported for each cable at the appropriate operating wave lengths, 850 nm, 1300 nm for multimode, and 1310 nm, 1550 nm for single mode. Optical attenuation measurements are to be done from both directions, end-to-end. (MC to TC, TC to MC, MC to existing MC, existing MC to MC) The length of each fiber shall also be documented.

   c. Using an optical time domain reflectometer (OTDR) all singlemode and multimode outside plant cables shall be tested.

      1) SM = 1310 nm and 1550 nm.

      2) MM = 850 nm and 1300 nm.
3) The test shall be reported to UMass Telcom.

d. Certificate of Compliance for connector and splice loss.

2. Voice/Data Horizontal Cabling System
   a. Perform Category 6 channel testing with a Level III accuracy cable tester on all Cat 6 cables.
   b. Save all results and provide UMass Telcom Engineer

3. UTP Backbone Cables
   a. Continuity
   b. Shorts
   c. Opens
   d. Length

3.21 GROUNDING AND BONDING
   A. Provide a suitable telecommunications ground for equipment as required per ANSI/TIA/ EIA-607 (telecommunications grounding), IEEE Emerald Green book and NEC requirements.
   
   B. All cable tray, ladder rack, access floors and equipment racks and/ or cabinets, outside plant cable contained within telecommunication spaces shall be grounded/bonded to the Telecommunications Grounding Busbar (TGB). The grounding busbar shall be provided by the Electrical Contractor.
   
   C. All aforementioned telecommunications devices shall be grounded/bonded to the TGB using stranded 6 AWG bare copper (AWG wire). Coordinate exact grounding locations for each component with the Electrical Contractor.

3.22 DEMOLITION
   A. The existing facility will be occupied during demolition work.
   
   B. Where sections of a system are to be removed and the system serves other areas of the building that are outside of the immediate scope of work, provide necessary branch circuitry to keep systems powered.
   
   C. Coordinate the temporary shut down of the system with the Owner’s representative.
   
   D. Coordinate with all Contractors and Subcontractors to provide disconnection prior to equipment removal.
E. Remove equipment by unfastening at the supports or attachments. Then remove the attachments from the building, leaving no component of the original installation.

F. The Owner shall have the option to choose to take possession of the equipment or not. If the Owner chooses not to take possession of the equipment, the Contractor shall remove and dispose of the equipment in accordance with the paragraph below.

G. 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.

H. Install relocated equipment to ensure no damage.

I. All equipment, etc., not turned over to the Owner shall be put into the dumpsters; become the property of the Contractor, and shall be removed from the site by the Contractor.

J. Remove existing equipment and appurtenances as indicated on demolition plans and as required to install the new systems.

END OF SECTION
SECTION 270000 - TELECOMMUNICATION SPECIFICATIONS

1 PART 1 GENERAL

1.0 REFERENCES

A. Materials and equipment shall be manufactured, installed and tested as specified in the latest editions of applicable publications, standards, rulings and determinations of:

5. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
6. ANSI/ICEA Insulated Cable Engineers Association.

1.1 WORK INCLUDED

A. Perform work and provide material and equipment as shown on Drawings and/or as specified and/or indicated in this Specification(s). The word “provide” as used in this document is to be defined as “provide and install”, unless otherwise qualified. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

B. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation. It is the responsibility of the Tel/Data Contractor to coordinate and verify that the cable pathways provided by other trades comply with the distance limits and the other pathway requirements specified in the written contract docs. Report any deficiencies to the Project Engineer. Refer to Cable Pathway requirements immediately below, plus other details in Section 2 and Section 3.

C. Cable pathways from each Tel/Data outlet back to the network switch must be pre-verified as not exceeding the length limit; that is, no installed Cat 6 or Cat 6A cable shall exceed 295 feet. Also any conduit run shall not exceed 270 degree total (eg say three 90 degree) bends, without having a readily accessible pull point. “Readily Accessible” means access such as removable acoustic ceiling tiles that, even after the building is occupied, will allow adding or replacing cables. All conduit bends shall be sweep bends with minimum bend radius 3”.

D. Provide a complete set of As-Built Plans showing all cable pathways and all accessible ceilings and cable access panel details to facilitate future cable repair and installation.

E. The word “Plans” is used here and generally to refer to all relevant Contract Drawings, which with the Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not
specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

F. 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. Horizontal cables connecting each workstation outlet will be run to the nearest Tel/Data Room (aka “IDF”).

G. Work shall include, but shall not be limited to, the following:

1. Faceplates.
2. Modular inserts.
3. Horizontal cable.
4. Patch panels and patch cables.
5. Fiber optic backbone cable (Inside and OSP)
6. Copper backbone cable (Inside and OSP)
7. Fiber optic termination enclosures, units and hardware
8. IDC termination blocks
9. Equipment racks and associated ladder rack systems
10. Electronic backbone equipment (hubs, switches, routers)
11. Uninterruptible Power Supplies (UPS)
12. Wireless Access Point (AP) devices
13. Building entrance protection systems
14. Cable management and support.
15. Ladder rack systems in T/D rooms.
17. Labeling and Documentation of all cabling and devices.
18. Grounding, Bonding and Electrical Protection.
19. Fire seal and fire-stopping.
20. Testing (with documentation) of all cabling and devices.
21. Supervision and approval.

22. Shop drawings.

23. Reference to Electrical and Telcom Contract Drawings for additional information.

24. Coordination with all disciplines including, but not limited to, Electrical Contractor, A/V Contractor, Equipment Contractor, Engineer and Architect.

H. Where conflicts exists within the contract documents, the Contractor shall own the greater quantity and higher quality.

I. Work not included:

1. Peripherals connected to the data cabling infrastructure (servers, workstations, printers, etc.) shall be provided by others.

2. In general, all voice equipment connected to telephone cabling infrastructure (phones, faxes PBX, etc.) shall be provided by others, with any exceptions explicitly specified. All line/equipment cards connecting voice equipment to the voice cabling infrastructure shall be provided by others.

1.2 QUALIFICATIONS

A. The successful bidder shall be thoroughly familiar with the cabling methods set forth in the latest release of the BICSI TDMM's (Building Industry Consulting Services International Telecommunications Distribution Methods Manuals) and unless otherwise specified, shall supervise the installation in accordance with the recommendations and practices outlined in the latest release of the BICSI Telecommunications Cabling Installation Manual.

B. The Telcom cabling contractor shall hold ADC/TE, or equal Certification status and therefore be able to provide an Extended Product Warranty program for the copper and fiber cabling system.

C. For fiber, the cabling contractor shall hold ADC or equal Certification status and therefore be able to provide an Extended Product Warranty program for the fiber cabling system.

D. The successful bidder shall have at least five (5) years experience installing and servicing Telecommunication systems, and shall provide a list of completed projects equivalent in size and complexity to this project, with contact names and telephone numbers. Personnel must have experience using a light meter and OTDR.

E. The successful bidder shall submit in writing a list of qualified technicians assigned to this project, including relevant manufacturers training programs completed by each, and years of related experience of each.

F. The successful bidder shall maintain an office or competent technical presence with appropriate testing equipment and replacement parts within 2 hours drive time from this project.

1.3 SUBMITTALS

A. Material and equipment requiring shop drawings submittals shall include, but not be limited to, all telecommunication components.
1. Face plates
2. Horizontal cable
3. Patch panels
4. Modular jack inserts
5. Fiber optic cable
6. Copper backbone cable
7. Fiber optic termination hardware
8. Inter-building copper multipair exchange cable
9. Coax cable
10. IDC termination blocks
11. Equipment racks & accoutrements
12. Cable supports and management
13. Building Entrance Protection
14. Wireless devices
15. Network Equipment
16. UPS

B. Submittal Requirements – pdf format required

1. Provide product data for all equipment shown on drawings or schedules, prepared by manufacturers, suppliers and vendors. Provide clear “indicating arrow” on all product data sheets to clearly identify which options and model choices are being submitted.

2. Submittals shall contain information specific to systems, equipment and materials required by Contract Documents for this Project only. Do not submit whole catalog sections that describe products, models, options or accessories other than those required.

3. At the completion of the construction, the contractor shall provide the following to the University of Massachusetts:

   a. “As Built” drawings developed from record drawings and design changes of each floor plan documenting the location and labeling of each telecommunication outlet and the approved University of Massachusetts labeling scheme. These drawings should be provided in AutoCAD format (electronic media).

   b. Test results of all the telecommunication systems, specified in Part 3 Execution of this specification.
c. An XL “Tel/Data Summary” Spreadsheet which lists all of the jacks, with locations and arranged by Tel/Data closet. Detailed requirements are specified in Part 3 Execution of this specification.

2 PART 2 PRODUCT

2.0 GENERAL

A. All devices shall comply with ANSI/TIA/EIA 568-C.1, C.2, C.3 Standard.

B. The wiring configuration for all telecommunications devices shall be T568B.

C. All UTP cabling shall meet or exceed all requirements in this specification, ANSI/TIA/EIA S-80-576 that are applicable to four-pair inside wiring cable. Where any portion of a cable runs through a plenum space within the building use plenum-rated cable. If there are no plenum spaces, use CMR type cables.

D. Manufacturer and part numbers are indicated throughout the specification to establish quality and performance characteristics and strict minimum performance requirements of individual products and the precise matching of tested and proven system combinations.

E. Where only one manufacturer or product/model is designated, and if there is no added note offering “or approved equal”, the particular product is likely to be specifically covered as a UMass standard installation requirement. Any deviation from the specified components/manufacturers must be clearly noted as such on the product submittal.

F. Any submittal deviating from the specification will require documentation proving equivalent performance to the specified products/system combinations. Final acceptance testing and warranties must strictly equal or exceed the performance specifications detailed herein.

G. The Cat 6 UTP horizontal cabling system (jacks cables and terminations) and patch cords shall all be manufactured by ADC/TE to match the existing standard campus cabling infrastructure.

H. UTP Station Cables: Provide and install a Category 6 manufacturer certified compliant horizontal cabling and hardware system from outlet jacks to patch panel terminations and through to switch ports, inclusive, and as specified below for each Data/Phone outlet shown on Contract Drawings

I. The Cat 6 & Cat 6A Horizontal Cabling System shall have a 20 year manufacturer's repair or replacement warranty.

2.1 FACE PLATES

A. Voice/Data Faceplates
   1. Single gang, 4 port ivory color faceplate shall be ADC # 6644 1 154-02

B. Wall phone faceplates
   1. As indicated on Plans
2.2 MODULAR INSERTS (RJ45 JACKS)

A. Single modular data inserts (RJ45 jacks) shall be 8 position, 8 conductor, T568B, Cat 6, ADC P/N KM8. They shall be blue, ADC product #6830-1 830-06.

B. Single modular data inserts (RJ45 jacks) shall be 8 position, 8 conductor, T568B, Cat 6A, ADC P/N KM8. They shall be green, ADC product #JF6A07.

C. Provide blank jack inserts as required. Color shall match that of the outlet wall plates. ADC Product #6645 1 160 02 (in the case of ivory wallplate)

2.3 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated ¾” thick by 48” by 96”.

B. Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

C. Refer to Plans and Details for additional information.

D. Backboards shall be AC grade with the ‘A’ side (smooth) facing out.

E. Backboards shall be fastened directly on particular walls in each telecomm room as designated on Plans and Details.

F. Backboard shall be painted with 2 coats of paint, color blue. Color: Sherwin Williams “Freshwater” #6774 or approved similar color.

2.4 HORIZONTAL CABLE

A. If the building HVAC is a ducted system, Non-Plenum rated cable should be used for the horizontal distribution. Alternatively, if the building uses the ceiling spaces as plenum for return air, cable must be plenum-rated.

B. Provide 4-pair Cat 6 ADC cable in quantities as indicated on Floor Plans. Jacket color to be blue.

C. Station cable shall be Cat 6, 24 AWG, 4-pair, UTP, tested to 550 MHz with riser rated jacket. No minimally compliant cable will be accepted. Cable shall be marked suitable for its purpose. Cat 6 cables shall have blue jackets. ADC/TE Product #TN6SR-BL.

D. Each wireless AP shall be fed by two Cat 6A cables. Cat 6A cables shall have green jackets. ADC/TE Product # TE640R-GN02

2.5 TERMINATION OF HORIZONTAL CABLE

A. At the network equipment rooms the horizontal cables shall terminate on patch panels in racks. Modular PnP 48 port rack mountable patch panel that accepts TE/ADC KM8 jacks: TE p/n: PP48PNPT

B. Slotted 6” cable manager bar behind every 2U (48 cables) of patch panel: TE MRJ21 p/n: 193352-1

C. In the case of low clearance behind the cable rack (against the wall) use a 2” cable support bar TE p/n: 406042-1
2.6 BUILDING FEEDER: COPPER MULTIPAIR CABLE

A. Outside plant multipair **copper cable** shall be 24 AWG, **PE-89 type**, foam skin, filled core, CALPETH type, made by Superior Essex or approved equal.

B. Where OSP cable is spliced in manholes, splice connector modules shall be 710-SC1-25 made by 3M. **Splice closures** used in manholes shall be **UCN** manufactured or equal sized for cable, and encapsulant filled.

C. Where OSP multipair copper phone cable enters buildings it shall be spliced to DIW riser-rated backbone cable. Riser rated splice closures shall be used to contain such splices.

D. Inside backbone cable shall be Superior Essex, Belden or ADC/TE, and plenum-rated wherever specifically required by code, but riser-rated if no plenum spaces involved.

2.7 FIBER OPTIC BACKBONE CABLE

A. General

1. The cable shall meet all requirements stated in this specification. The cable shall meet the requirements of the United States Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900 and the ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-1992.

2. **ACCEPTABLE MANUFACTURERS:** Corning, ADC/TE, Superior Essex, but all cables must be **manufactured with and identified as Corning glass.**

B. Building Feeder: Fiber Cable

1. Cables shall meet or exceed TIA/EIA 568-C specifications for performance and be **indoor/outdoor rated**, all dielectric design, with fully water blocked core. Sized as indicated on Plans.

2. Cables shall meet or exceed TIA/EIA 568-C specifications for performance. Cables shall be OFNR rated with dry loose tube cables. Product TE #QXXXDLTIOR010 (**singlemode**) (XXX = strand count), or approved equal. Sized as indicated on Plans.

C. Building Riser Fiber:

1. All fiber optic cables shall meet or exceed TIA/EIA 568-B specifications and UL 910 for performance. All fiber optic cables shall be UL listed OFNR rated with fibers individually wrapped in a color-coded 900 micron tight buffer ADC/TE Product #60XXAIRCBC010 (**singlemode**) (XX = strand count)

D. Associated Products

1. Textile Innerduct: All fiber cables installed in outside ductbanks shall be installed in textile innerduct such as **3-cell Maxcell**, sized for each particular duct, or approved equal.

2. Where installed indoors, all fiber shall be installed in white 1” innerduct, riser-rated.

3. Fiber shall be terminated in equipment racks using Corning CCH-0XU cabinets appropriately sized (X = height of cabinet in rack U).
4. Where fiber terminations cannot be terminated in an equipment rack, a wall-mounted enclosure unit shall be used. In such cases, provide Century 72 port enclosures of sufficient capacity, with UMass standard key/locking where indicated. 72 port fiber termination enclosure, Century # FCP 72ST UMLS (No substitutes, must match existing arrays).

2.8 FIBER OPTIC TERMINATIONS AND CONNECTORS

A. Connectors shall be **LC duplex** type connectors with **fusion splice pigtails** installed in Corning termination cassettes (CCH cassettes p/n: CCH-CS12-A9-P00RE or CCH-CS24-A9-P00RE).

B. Fiber cabinets shall be Corning CCH cabinets, that accept CCH cassettes, Corning p/n: CCH-XXX (XXX = size of cabinet: 01U, 02U, 03U, 04U) large enough to terminate all fiber entering the room.

2.9 TERMINATION REQUIREMENTS FOR VOICE RISERS

A. At the MDF/Cable entrance room the voice riser cables originate that feed all of the Tel/Data Rooms. At the **MDF end**, the voice risers shall be **terminated on the wall**. Manufactured by Belden, Leviton or TE. At the other end, the voice riser cables run to each Tel/Data Room and terminate in the Patch Panel Racks.

B. In the MDF Room, provide **split D-rings** on portions of the backboard where cross-wiring and patch cables lack management and support; spacing intervals approx. 12”

C. At the other end of the riser cables, provide **48 port rack-mountable plug and play patch panels** (same as specified for station cables) for all voice riser cables, terminating 2 pairs onto each modular jack insert.

D. Provide **labeling** strips for each patch panel.

E. Provide **1U ringed horizontal cable manager** above and below each patch panel. TE p/n: 6653 2 700-03 or equal.

2.10 EQUIPMENT RACKS

A. Floor mounted racks shall be 7’H x 19”W, manufactured by Chatsworth or approved equal.

B. **Vertical wire management** shall be 6” Chatsworth P/N 30162-703 CCS Combination Cabling Section.

C. **Equipment racks stacked next to each other** shall each have their own vertical management, as specified above, on either side of the rack.

D. Install one **1U ringed horizontal cable management panel** between each 48 port patch panel, and at the top of every rack, TE p/n: 6653 2 700-03

E. Each rack shall have a **double shelf** (front/back) installed at the lowest level for placing UPS units.

2.11 CABLE SUPPORTS AND MANAGEMENT

A. Cable hangers shall be open-top cable supports (J-Hooks), 2” diameter loop, Brady manufactured or approved equal.

B. J-Hook cable hangers shall be rated for **Cat 6 support** & Brady manufactured or equal.
C. J-Hook system support bar shall be Brady manufactured or equal.

D. J-Hook supports shall be installed in accordance with the manufacturer recommendations and located at intervals such that the cables do not rest on ceiling tile or grid at any point along the distance. Refer to Part 3 (Execution) of this specification for additional cable routing requirements.

E. Cable management straps shall be of the velcro variety, ADC/TE P/N VCM-25-06-1 (6 inch) or P/N VCM-25-12-1 (12 inch) or approved equal.

2.12 PATCH CORDS

A. Patch cords shall be provided by Contractor, and installed by Contractor under supervision of UMass/IT.

B. **Cat 6A Patch Cords:**
   1. Tel/Data rooms:
      a. Patch cords for data shall be 24AWG stranded, Cat 6A ADC/TE type **RJ45 to RJ45**, lengths shall be: 75% - 15', 25% - 20'.
      b. Color: **Green**.
      c. Provide **two Cat 6A patch cords** every AP location.

C. **Cat 6 Patch Cords in Tel/Data Rooms:**
   1. Patch cords for data shall be 24AWG stranded, Cat 6 ADC/TE type **RJ45 to RJ45**, lengths shall be: 50% - 15', 25% - 20', 25% - 25'.
   2. Color: Blue.
   3. Provide patch cords for **75%** of all terminated Cat6 outlets.

D. **Fiber Optic Patch Cords:**
   1. Provide fiber optic patch cords for cross-connection to backbones or active equipment of type LC to LC duplex. **Quantity**: equal in quantity to enable patching 40% of the fiber terminations at each location. **Lengths**: 80% to be 1.5 meters, and 20% 2 meters.

   2. **They shall be of type**: bend-insensitive, short boot, LC-LC duplex SM Corning fiber jumpers.

2.13 CABLE RUNWAY/LADDER RACK SYSTEM

A. **18” and 12” Cable Runway and Ladder Rack products shall be manufactured by Cooper B-Line, CPI or Homaco.**

B. **Provide all components to make a complete system.**

C. Such other components shall include: Butt Splice kits, Wall Angle Support Brackets, Junction Splice kit; Threaded ceiling kit; Grounding kit; Mechanical Fasteners to connect to the top of Equipment Racks and Cable Drop-Outs.
2.14 WIRE MESH FLEXTRAY CABLE SUPPORT SYSTEM
   A. Provide Wire Mesh Cable Tray systems where indicated on Plans. Wire Mesh Cable Tray systems shall be Cooper B-Lines Flextray, P/N FT2X4X10 or approved equal.
   B. Provide all associated supports and system fittings required to make a complete pathway system wherever indicated on Plans. Install according to manufacturer’s installation manual.

2.15 FIRE-RATED CABLE PATHWAY UNITS
   A. Provide one Fire-Rated Cable Pathway unit wherever station cables are shown emerging from Tel/Data Closets via fire-stopped sleeve arrangement. The Fire-Rated Pathway should have a cable capacity equal to double the quantity of existing cables emerging from the closet. Use EZ-Path # EZDP33FWS or approved equal.

2.16 BUILDING ENTRANCE PROTECTION
   A. Building Entrance Protection Units shall be comprised of Circa Telecom model #1880B1-100K: 100 PAIR - INDOOR BET with 25' OSP AIR CORE CABLE STUB/110 - NO COVER, or approved equal.
   B. Protector Modules shall be 5-pin Circa Telecom #3B1E. Install protector modules in all sockets.
   C. Provide Building Entrance Protection Units at the Campus tie-in point for the origin of the phone feeder cable. The Campus phone cable tie-in point shall be designated in the Plans.

2.17 NETWORK EQUIPMENT (PLACEHOLDER)
   A. Designer to coordinate with UMass IT to determine how/who buys the switches, UPS’s, AP’s (below) PLUS
   B. Designer to coordinate on: the equipment list that will be generated by UMass IT

2.18 WIRELESS ACCESS POINTS (AP) (PLACEHOLDER)
   A. The Designer must coordinate with UMass IT: Provide final DD floor plans and UMass IT will determine where to place the Wireless AP’s and what AP model.

2.19 MISCELLANEOUS
   A. Provide a 3-foot step ladder in every UMass IT Room, labeled “UMass IT, & Room #”, using 3” lettering.

3 PART 3 EXECUTION

3.0 GENERAL
   A. All installed devices shall comply with ANSI/TIA/ EIA 568-C.1, C.2, C.3 Standard.
   B. All telecommunication outlets shall be T568B wiring configuration.
C. All UTP cabling shall meet or exceed all requirements in this specification, ANSI/TIA/EIA S-80-576 (pair color code, etc) that are applicable to four-pair inside wiring cable for plenum spaces within a building.

D. Coordinate all work with all contract documents including but not limited to:
   1. Architectural floor plans and equipment layouts.
   2. Electrical contract documents.
   3. Mechanical equipment.

E. Coordinate all work with all on-site contractors including, but not limited to:
   1. Data switch installer.
   2. Other contractors and consultants.
   3. Electrical Contractor.

F. Refer to Electrical Contract Drawings for pathways including sleeves, conduits, cable tray to be utilized by this contractor.

G. Refer to Electrical and Telecommunications Contract Drawings for additional information.

H. Cooperate and coordinate with work of other sections in executing work of this section.

I. Perform work so that progress of entire project including work of other sections is not interfered with or delayed. Obtain detailed installation information from all manufacturers of equipment provided under other sections.

J. Provide information as requested on items furnished under this section which shall be installed under other sections.

K. Materials and Workmanship:
   1. Work shall be executed in workmanlike manner and shall be neat, plum, parallel to the building structure, perpendicular to all electronics and associated cabling and neat in appearance when completed. All work shall adhere to the standards as set forth in this specification. Maintain maximum headroom at all times. Do not run work exposed unless shown exposed on drawings.
   2. Material and equipment shall be new and installed according to manufacturer's recommended best practices so that completed installation shall operate safely and efficiently, and be neatly installed.

L. This contractor owns the greater quantity and better quality where conflicts exist.

M. **Continuity of Services:** Do not interrupt existing services. Existing services shall remain operational at all times. If the existing services need to be disrupted for any reason the contractor shall contact the Owner (representative to be announced at a later date) and schedule the aforementioned shutdown. The contractor shall schedule the shutdown with the Owner 48 hours in advance.
Any reference to **telecommunication outlet** shall indicate faceplate, modular insert, termination, cabling, labeling, testing, etc.

All cabling shall be **terminated** at both ends unless noted otherwise.

All cables shall be clearly, permanently and robustly **labeled** at both ends, with **machine printed labels**. Where cables pass through manholes, label each cable with a plastic weatherproof label, 1” high lettering.

To minimize EMI interference, maintain maximum **separation** of tel/data cabling from power wiring and conduits wherever feasible; 6” separation generally acceptable. Maintain **12” separation** of tel/data cabling from **fluro ballasts** and wherever feasible.

### 3.1 BUILDING ENTRANCE PROTECTION

A. **Provide layout** proposals to UMass IT Cable Engineer for approval, before installing the BEP termination modules at each end of the Outside Plant Cable.

B. Provide adequate **cable management** capacity for future crosswires from the BEP to station and riser terminations.

### 3.2 COPPER BACKBONE CABLE

A. Provide outside plant cable and inside plant cable as detailed in the riser diagram.

B. Provide adequate and reasonable **service loops**, say 20 feet after every 1000 feet of ductbank. Provide 20 ft. service slack in the last manhole before entering any building. Provide 15 ft. of service slack in the cable entrance room.

C. Provide durable waterproof **plastic labels** on every new cable with 1” high machine lettering; 1 label per cable, per manhole. UMass will provide cable ID names (that should be printed by the Contractor).

### 3.3 FIBER OPTIC BACKBONE CABLE

A. Provide outside plant and inside plant fiber cable as detailed in the riser diagram.

B. Provide adequate and reasonable **service loops or slack**, say 20 feet after every 1000 feet of ductbank. Provide 20 ft service loop in the last manhole before entering any building. Provide 20 ft of service slack in the cable entrance room.

C. In Tel/Data rooms provide about 15 ft of service loop, coiled conveniently out of the way, at each end of fiber riser cables.

D. In Manholes: provide durable **waterproof plastic labels** on every new cable with 1” high machine lettering; 1 label per cable, per manhole. UMass will provide cable ID names (that should be printed by the Contractor).

### 3.4 FIBER OPTIC TERMINATION HARDWARE

A. No fiber connectors should be installed until the **Tel/Data rooms are clean and dust-free**. Also if there is any structural metal that has fire-proofing compound sprayed on it, no fiber connectors
should be installed until the **fireproofing compound** has been **sealed behind sheetrock** and all dust is eliminated.

B. Provide **duplex LC connector** hardware mounted at each end of the fiber runs.

C. All SM fiber terminations shall use pigtails and Corning Cassette termination units. Label all fiber terminations with **ID# approved by UMass IT**.

D. All fiber optic strands shall be terminated, tested, labeled and documented.

E. Refer to Contract Drawings, for fiber patch panel locations and details.

3.5 **FIBER PATCH CORDS**

A. Provide bend-insensitive, short boot, LC-LC duplex SM fiber of length 1.5 meters. **QUANTITY:** One per network switch.

3.6 **MULTIPAIR COPPER CABLE TERMINATION BLOCKS** (ALL WALL-MOUNTED IN MDF)

A. Provide IDE **110 block termination** hardware to terminate all of the copper voice riser in the MDF Room. (All of the other (Tel/Data room) ends shall be terminated in the patch panel racks.) Refer to Drawings for locations, termination types and schematic details.

B. Provide UMass IT with **equipment layout proposals** for each Tel/Data room. Get written approval before proceeding with associated installation.

3.7 **HORIZONTAL CABLE**

A. Provide horizontal voice/data station cables from each work station outlet back to its designated Tel/Data Room and terminate in a patch panel rack.

B. Provide one (1) horizontal Cat 6 cable from each modular insert to its corresponding RJ45 patch panel termination.

C. All four pairs of each horizontal Cat 6 cable shall be terminated at both ends in an 8 position, 8 conductor modular insert using T568B configuration.

D. Install wire and cable in approved/provided raceways and cable tray as specified and as approved by the authorities that have jurisdiction.

E. Cable Pulling: Pulling Tension: Maximum pulling tensions for 4-pair horizontal UTP cable shall not exceed 110N (25 lbf).

F. Maintain cable twist to within ½” of the main point of Insulation Displacement Contact (IDC).

G. When stripping cable for termination remove only a minimum amount (i.e., as little as possible) of cable jacket insulation. (Refer to Manufacturer’s Cat 6 specifications)

H. Additional cable slack (service loop) shall be provided at both ends for maintenance or future cabling system changes:

1. Telecommunications Outlet = 2 feet
2. In the T/D Room, the extra cable slack shall be achieved by taking the cable via the longest pathway through the room to the patch panel.

I. Splices are not permitted for any horizontal cabling.

J. No horizontal cable run shall exceed a cable length 295 feet (90 m).

3.8 WIRELESS ACCESS POINTS (AP) (PLACEHOLDER)

A. Install Wireless AP devices as indicated on Plans

B. Designer to coordinate//get this section from UMass IT

3.9 FACE PLATES

A. Provide all face plates for telecommunications outlets.

B. Coordinate with the Architect for color of all faceplates.

C. Coordinate with the Electrical Contractor for mounting compatibility.

D. Refer to the Contract Drawings for the exact quantity and location of the telecommunications outlets.

E. Refer to the Contract Drawings for configuration of faceplates.

3.10 MODULAR INSERTS

A. Provide all modular inserts. Refer to telecommunications details for the exact quantity and orientation of modular inserts within each telecommunications faceplate.

3.11 PATCH CORDS

A. Contractor shall install data patch cords based on switch port assignment lists to be provided by UMass IT.

B. Dress, manage and support all patch cables neatly.

C. Label each patch cord at both ends with: Sw.& Port# /Jack#

3.12 EQUIPMENT RACKS

A. Provide equipment racks as noted on Plans and Details.

B. Each equipment rack shall house equipment and devices of the following types in various quantities:

1. Switches and routers; refer to equipment rack Schedules and Equipment List for specific requirements


3. A double shelf near the base with the UPS unit as specified.
4. Vertical cable management.

5. Locate/coordinate the location of the receptacle(s) for the UPS unit(s) on the equipment racks near the base. If to minimize any tripping hazard.

C. Provide quantity of racks as required to house the aforementioned equipment and devices. Refer to contract Drawings for quantities and locations.

D. Provide two vertical wire managers per rack.

E. Provide horizontal wire managers as detailed in the tel/data elevations.

F. All racks shall be secured to the floor using the factory recommended hardware and installation practices.

G. All racks shall be properly grounded, conforming to ANSI/TIA/EIA 607, NEC and all related grounding standards and codes.

H. Install cable racks in accordance with ANSI/NFPA 70, Article 318 requirements and as specified herein.

I. Ladder rack in each Tel/Data closet shall be secured to the top of the equipment rack. This is to assist with cable transition into the rack. In addition, this shall keep the rack from any swaying. Racks shall not sway more than ¼ inch when leaned against.

3.13 PATCH PANEL RACKS

A. Provide equipment racks for patch panels as noted on Plans and Details, to be used to terminate all station/horizontal cabling.

B. All of the requirements noted above for Equipment Racks shall also apply to the Patch Panel Racks.

3.14 NETWORK EQUIPMENT (PLACEHOLDER)

A. DESIGNER to coordinate this section: UMass IT will provide requirements

3.15 CABLE SUPPORTS AND MANAGEMENT

A. Generally, cable pathways are provided by others. The pathways shall be parallel to building lines and shall sweep/turn at 90 degree angles maintaining minimum bend radius for cable and will comply with the guidelines and recommendations outlined in ANSI/TIA/EIA-568-C and ANSI/TIA/EIA-569-A.

B. Provide cable and supports as required. All cables shall be supported.

C. Where cable tray, ladder rack and conduit are not provided for support of the telecommunication cables, provide J-Hook cable supports, at 4 to 5 foot intervals.

D. Cable supports shall be mounted independently from the building structure. Cables shall not be supported from mechanical, electrical, fire protection or plumbing devices.

E. Where metal conduit is provided by others for use by the telecommunications contractor, provide each end of the conduit with plastic grommets for cable sheath protection.
F. Provide all strain relief and adequate support for purpose of maintaining bend radius and providing additional protection/support of exposed cables and with particular attention to fiber cables and fragile fiber patch cords. Run fiber cables in innerduct or finger duct.

G. At all equipment racks, provide velcro straps at 1 foot intervals for support of cables.

H. Voice and Data Infrastructure

1. Provide management and support as required. Refer to telecommunications drawings and details for location and quantity of horizontal cable management.

2. Provide vertical management on each equipment rack.

3.16 CABLE RUNWAY/LADDER RACK SYSTEM

A. Provide 18” ladder rack in Tel/Data Rooms, and as shown in Drawings.

B. Refer to Plans for details.

3.17 WIREMESH FLEXTRAY CABLE SUPPORT SYSTEM

A. Provide complete Flextray support systems at locations shown in Drawings.

B. Refer to Plans for details.

A. Provide all associated supports and system fittings required to make a complete pathway system wherever indicated on Plans. Install according to manufacturer’s installation requirements.

3.18 LABELING AND IDENTIFICATION

A. All jack labels shall be clearly printed on clear or opaque tape and meet the following requirements:

1. The font shall be approximately 1/8” in height block characters and clearly legible.

2. The text and color shall contrast with the label background (e.g. black on white).

3. Hand written labels are not acceptable.

4. All labeling material shall meet the minimum flame rating requirements.

B. Provide labeling as required.

C. Provide description strips in the face plate/outlet and/or patch panels. Patch panel(s) layout per system services shall exhibit all station outlet numbers in sequential order. Each faceplate/outlet shall have a separate number. Office numbers shall not be used as cable numbers.

D. Designation strips shall be securely attached to the equipment.

E. All cables shall be clearly labeled at both ends. All termination points shall be clearly labeled.

F. Faceplates shall be labeled at top with IDF#, faceplate# and cable # in format provided by UMass. If the faceplate has more than one cable, bottom position label is also required.
G. Contractor shall only use labeling schedules or labeling conventions for faceplates, cables and T/D Closet terminations provided by UMass Telcom Dept.

H. Provide warning tags at each location where fiber optic cable is exposed to human intrusion. These tags shall be YELLOW or ORANGE and shall contain the warning: "CAUTION FIBER OPTIC CABLE". The text shall be permanent, black, block characters and be at least 3/16" high. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not more then five feet (5'-0''). Any section of exposed cable that is less than five feet (5'-0'') in length shall have at least one warning tag affixed.

I. Provide fiber optic warning tags at all fiber optic patch panels i.e. the laser hazard to vision.

3.19 TESTING, INSPECTION AND CLEANING

A. All cables (UTP and fiber) shall be tested as noted below.

B. Provide “soft copy” (electronic media) of all test results. Hand written test results will not be accepted. Electronic formats of test data shall be non-proprietary such as pdf or Excel.

C. All testing shall be completed after all telecommunication outlets have been secured in their final position and are properly labeled per this specification.

D. Building must be operational (i.e. building lighting and power must be energized).

E. Provide the Owner with the following documentation and test results for all cables.

1. Fiber Optic Cables
   a. Using an optical time domain reflectometer (OTDR), test and record the quality of each cable while still on the reel, prior to installation, to verify that no damage has occurred during shipment. This test needs to be done in one direction only.
   b. Using an optical power meter, measure end-to-end attenuation for all installed cables, including: all connectors, the terminated fiber itself; all connectors, and patch panels. The total loss shall be measured and reported for each cable at the appropriate operating wave lengths, 850 nm, 1300 nm for multimode, and 1310 nm, 1550 nm for single mode. Optical attenuation measurements are to be done from both directions, end-to-end. The length of each fiber shall also be documented.
   c. Using an optical time domain reflectometer (OTDR) all singlemode outside plant cables shall be tested at the following wavelengths.
      SM = 1310 nm and 1550 nm.
      The tests shall be documented and reported to Owner.
   d. Certificate of Compliance for connector and splice loss.

2. Voice/Data Horizontal Cabling System
   a. All Horizontal Cat 6 link testing shall be performed with a Level III accuracy cable tester updated with the most recent firmware.
   b. Line map continuity
   c. Length
d. And all other results of parameters with Cat6 requirements

3.20 UTP BACKBONE CABLES

A. Continuity

B. Shorts

C. Opens

D. Length

3.21 AS-BUILT DOCUMENTATION

A. **Provide ACad drawings.** Show exact As-Built locations of every Tel/Data outlet, indicating final label, ID# information. Room numbers shall be the official UMass assigned numbers.

B. **On those ACad drawings also indicate power circuits that feed Tel/Data Rooms** giving all power panel branch ID numbers and the locations of the power panels.

C. Provide As-Built Cable Test Summary information compiled into a single Excel spreadsheet for all Cat6 and Cat6A jacks. Compile that Excel Spreadsheet data with a separate page tab for each Tel/Data Room, with a line for every cable, and with columns for: cable #, faceplate #, and the actual jack label ID#, the location (use the official UMass room #) of the jack, its test result summary (eg “Cat6 Pass”), and the date of the test. (see Figure 1; **As-Built Jack Data Spreadsheet, Example** just below)
Similarly, provide As-Built Cable Test Summary information compiled into a single Excel spreadsheet for all fiber cables. Compile that Excel Spreadsheet data for the Fiber Entrance Room (FET), with a separate tab for every fiber cable, detailing test results summary and the date of the test.

3.22 GROUNDING AND BONDING

A. Provide a suitable telecommunications ground bus bar (TGB) in every Tel/Data Room for equipment as required per ANSI/TIA/ EIA-607 (telecommunications grounding), IEEE Emerald Green book and NEC requirements.

B. All cable tray, ladder rack, access floors and equipment racks and/ or cabinets, outside plant cable contained within telecommunication spaces shall be grounded/bonded to the Telecommunications Grounding Busbar (TGB). The grounding busbar shall be provided by the Electrical Contractor.
C. All aforementioned telecommunications **components** shall be grounded/*bonded to the TGB* using stranded 6 AWG bare copper (AWG wire). Coordinate exact grounding locations for each component with the Electrical Contractor.

D. In each Tel/Data room, also bond the TGB to building steel with a #6 bare copper wire.

### 3.23 WIRELESS ACCESS POINTS

**A.** Wireless AP Termination Details:

1. Terminations at the AP end shall be male RJ45
2. Cat 6A termination in patch panel in network closet
3. Components from same vendor/"family" as used in standard wired connections
4. Two Cat6A cables shall run to each AP location
5. All Cat6A runs must pass Cat6A testing prior to installing AP’s
6. Cat6A test results must be turned over to UMass IT (UMass IT).

**B.** Wireless AP Outlet Location Details

1. Install AP’s as close as possible to the location indicated on Building Plans.
2. All wall-mount outlets that are approved by UMass IT shall:
3. Use purpose-built hardware to mount AP parallel to floor
4. Use mount hardware reviewed and approved by UMass IT
5. Not be closer than 10” to finish ceiling height
6. Movement of any AP outlet more than 3 feet or to a different room/wall shall require explicit UMass IT sign-off and may incur substantial delay as it may be necessary to fully re-engineer the entire building wireless AP layout
7. Significant changes in construction materials (e.g. drywall and steel studs to concrete masonry units) must be communicated to UMass IT for evaluation as such changes may require wireless layout re-engineering
8. AP height not to exceed 10’ above finish floor without explicit UMass IT sign-off
9. All APs must be exposed and visible to end-users, not hidden above drop ceiling or in enclosures without explicitly sign-off by UMass IT
10. Ceiling-based AP outlets must be approximately co-planar with other ceiling-based AP outlets in the same vicinity
11. Ceiling-based AP outlets should be approximately co-planar with other ceiling-mounted objects to the extent possible
12. Wall-mounted AP outlets in the same vicinity should be co-planar to the extent feasible and should be co-planar with ceiling mounted APs in the vicinity

13. AP outlets must be located a minimum of 5 feet away from Distributed Antenna System antennas

14. AP outlets must be located a minimum of 3 feet away from other ceiling- or wall-mounted objects including but not limited to:
   a. Lighting fixtures
   b. Building system elements including fire sprinkler heads or alarm units, ventilation systems, sensors, etc.
   c. Technology systems such as projectors, flat-screen displays, digital signage, etc.

15. AP outlets must be below the plane of or at least 3 feet away from radio-frequency-opaque objects including but not limited to:
   a. Projection screens and whiteboards
   b. Metallic fire sprinkler piping greater than a nominal 2” pipe size
   c. Metallic ventilation ducts, grilles or diffusers, and fume hoods
   d. Metallic cladding on walls or soffits

C. Wireless AP Installation, Turn-Up, and Validation Process

1. University shall purchase wireless APs and appropriate counts of mounting kits using project furniture, fittings, and equipment (FF&E) funding.

2. UMass IT staff shall assign each wireless AP to a location. Assigned building, room number, and network jack/cable numbers will be clearly indicated on the outside of each wireless AP box (i.e. its packaging).

3. UMass IT staff shall assign each AP to a designated port on a designated network switch.

4. UMass IT shall then turn over APs, mounting kits, and AP port assignment information to contractor.

5. Contractor shall install AP mounting kits and mount wireless APs in assigned locations in new building.

6. Contractor shall connect wireless AP port “ETH0” to the lower-numbered station cable at each AP outlet location

7. If the wireless AP at a given location has second port marked “ETH1”, contractor shall connect wireless AP port “ETH1” to the higher-numbered station cable at each AP outlet location

8. Contractor shall install and label ONE (only) network patch cable for each installed AP in a fashion consistent with UMass labeling requirements. This patch cable will be installed between the lower-numbered AP outlet location station cable on the patch panel and the UMass IT-assigned network switch and port location.
9. After the Contractor reports complete installation of all wireless APs in the new building UMass IT will power on and check reachability of each wireless AP. Any wireless APs that do not come on-line will be referred to the building contractor for verification and rectification of network wiring and patching issues.

10. Once all wireless APs are on-line UMass IT will configure wireless APs to provide wireless network service to users.

11. UMass IT will verify wireless network coverage in new building after wireless networks are provisioned.

12. Any areas in a building identified with inadequate coverage based on UMass IT coverage verification and current wireless coverage standards must have additional cabling and wireless APs installed by building project through a change order process.

END OF SECTION