Copy No._____

TOWN OF BOXFORD, MASSACHUSETTS
CONTRACT DOCUMENTS
FOR

Boxford Town Hall/Library HVAC, Exterior Repairs, and Library Renovation Project

July 15, 2020

Town of Boxford
Office of Town Administrator/CPO

Boxford Town Hall
7A Spofford Road
Boxford, MA 01921

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SECTION 00020

INVITATION FOR BIDS

Sealed bids for furnishing the following item will be received at the Boxford Police Station, 285 Ipswich Road, Boxford, MA until the time specified below at which time the bids will be publicly opened and read:

ITEM	BID OPENING
Bid: Sub-Bid for "Boxford Town Hall/Library HVAC, Exterior Repairs, and Library Renovation Project"	Tuesday, August 18, 2020; 11:00 a.m.
Bid: General Bid for "Boxford Town Hall/Library HVAC, Exterior Repairs, and Library Renovation Project"	Thursday, August 27, 2020: 11:00 a.m.

Specifications and bid forms may be obtained electronically from the Design Architect, Gienapp Architects, by email to: swoodson@gienapparchitects.com . Please note request for "Boxford Town Hall Project". Documents are available as of July 15, 2020, Monday through Friday between 9:00 a.m. and 5:00 p.m.

Filed Sub-bids will be opened in the Boxford Police Station, 285 Ipswich Road, Boxford, MA on Tuesday, August 18, 2020 at 11:00 a.m. General Bids will be opened on Thursday, August 27, 2020 at 11:00 a.m. at the same location. Each Bid and filed sub-bid must be accompanied by a bid security consisting of a BID BOND, CASH, or, CERTIFIED CHECK issued by a responsible bank or trust company in the amount of 5% of the bid price.

Pre-Bid Conference and Site Visit will be held at the Front Entrance of Boxford Town Hall/Library, 7A Spofford Road on Thursday, August 6, 2020 at 11:00 a.m. It is imperative that all prospective bidders have a representative in attendance.

A performance bond in an amount equal to 100 percent of the total amount of the contract price with a surety company qualified to do business in the Commonwealth of Massachusetts will be required for the faithful performance of the contract as well as a labor and materials bond in an amount equal to 100 percent of the total contract price.

All bids for this project are subject to applicable public bidding laws of Massachusetts, including G.L. c.149, § §44A through 44H, as amended.

Attention is directed to the minimum wage rates to be paid as determined by the Commissioner of Labor and Workforce Development and the weekly payroll record submittal

requirements under the provisions of Massachusetts General Laws, Chapter 149, Section 26 through 27D inclusive.

Attention is further directed to the requirements of G.L. c.149, §44D requiring submission of a Division of Capital Asset Management approved Certificate of Eligibility and Update Statement with all bids.

Selection of the contractor will be based upon bidder qualifications, including evidence of past performance in similar projects, and bid price. The contract will be awarded to the bidder deemed by the awarding authority to be the lowest responsible and eligible bidder.

The bidder agrees that its bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of the bids.

The Town of Boxford reserves the right to waive any informalities, to accept or reject, in whole or in part any or all bids, or take whatever other action may be deemed to be in the best interest of the City/Town.

Town of Boxford

By Alan J. Benson

Its Town Administrator/CPO

SECTION 00100

INSTRUCTIONS TO BIDDERS

1. Receipt and Opening of Bids

The Town of Boxford, Massachusetts, herein called the Owner or Awarding Authority, acting by and through its Permanent Building Committee and Town Administrator/CPO, will receive sealed Bids for the project known as

Boxford Town Hall/Library HVAC, Exterior Repairs, and Library Renovation Project

This Project is subject to the public bidding statutes, G.L. c. 149, §§44A-44H, including filed sub-bids for the trades noted herein. Filed sub-bids addressed to the Boxford Police Station, 285 Ipswich Road, Boxford, MA and endorsed "**Sub-bid for Boxford Town Hall/Library HVAC, Exterior Repairs, and Library Renovation Project**: **Filed Sub-bid for _____**", will be received at the Boxford Police Station, 285 Ipswich Road, Boxford, MA until 11:00 a.m. prevailing time, on Tuesday, August 18, 2020, at which time and place said filed sub-bids will be publicly opened and read aloud.

General bids similarly addressed to the Boxford Police Station, 285 Ipswich Road, Boxford, MA and endorsed "**General Bid for Boxford Town Hall/Library HVAC, Exterior Repairs, and Library Renovation Project** " will be received at the Boxford Police Station, 285 Ipswich Road, Boxford, MA until 11:00 a.m. p.m. prevailing time, on Thursday, August 27, 2020, at which time and place said bids will be publicly opened and read aloud.

. Sub-bids: Every sub-bid shall be for the complete work of the sub-trade as specified, and must be submitted on the Form for Sub-bid furnished by the Awarding Authority, a sample of which is included in these Contract Documents.

1. Every such sub-bid shall be accompanied by a bid deposit in the amount of 5% of the Bid.
2. Every sub-bidder duly filing a sub-bid with the Awarding Authority shall be bound thereby to every general bidder not excluded therein from the use thereof; and any variance from such sub-bid communicated to a general bidder shall be of no effect.
3. Every sub-bid for a sub-trade designated in Item 2 of the FORM FOR GENERAL BID shall be publicly opened and read by the Awarding Authority at the time and place specified in the advertised Invitation to Bid. Not later than the second day, Saturdays, Sundays and legal holidays excluded, prior to the advertised General Bid Deadline, the Awarding Authority shall mail to every person on record as having taken a set of Contract Documents, a list of sub-bidders. The list shall be arranged by sub-trades and

listing for each sub-trade the name, address and sub-bid price of every sub-bidder who has submitted a sub-bid which has not been rejected by the Awarding Authority.

Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified will not be considered. The bidder agrees that its bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids.

2. Location and Work to be Done

The Work consists of HVAC, exterior improvements (masonry, flashing), partitions, flooring, ceilings, painting, and other work related to the above.

The location, general characteristics, and principal details of the Work are indicated on plans entitled: Boxford Town Hall HVAC, Exterior Repairs, Library Renovations.

Additional drawings showing details in accordance with which the Work is to be done may be furnished by addendum from time to time during the bidding period by the Owner or its Architect/Engineer, and shall then become a part of the Contract Documents.

The Contractor shall furnish all labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, and all other things necessary to do all work required for the completion of each item of the Work and as herein specified.

The Work to be done and paid for under any item shall not be limited to the exact extent mentioned or described but shall include all incidental work necessary or customarily done for the completion of that item.

3. Preparation of Bid

Each bid must be submitted on the prescribed form. All blank spaces for bid prices must filled in, in ink or typewritten, in both words and figures.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, and endorsed with the name of the project as specified in Receipt and Opening of Bids, above. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in Receipt and Opening of Bids, above.

4. Bid Opening Procedure

The following list of requirements shall apply to each filed bid. Bids not meeting all the requirements for timeliness and security will be rejected; bids not meeting signature and addenda requirements will be rejected prior to checking of bid amounts.

Bids shall be filed at the place and before the time specified in Receipt and Opening of Bids, above.

Properly executed bid security shall be placed in a sealed envelope and shall be attached to the outside of the envelope containing the bid.

Bid signatures will be checked.

All addenda will be sent certified mail, with return receipt requested, and/or facsimile or e-mail to all prospective bidders.

The total dollar amount of each bid will be read. All those present at the bid opening may examine all bids after the bid opening.

5. Modification

Any bidder may modify his bid by written communication at any time prior to the scheduled closing time for receipt of bids. Any telegraphic communication must be received by the Owner prior to the closing time, and, provided further, the Owner must be satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed prior to the closing time. If written confirmation is not received within two days from the closing time, no consideration will be given to a telegraphic communication.

The communication shall not reveal the bid price but shall provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened.

6. Ability and Experience of Bidder

No award will be made to any bidder who cannot satisfy the Owner that he has sufficient ability and experience in this class of work and sufficient capital and plant to enable him to prosecute and complete the work successfully within the time named. The Owner's decision or judgment on these matters will be final, conclusive, and binding.

The Owner may make such investigations as it deems necessary, and the bidder shall furnish to the Owner, under oath if so required, all such information and data for this purpose as the Owner may request.

7. Conditions of Work

Each bidder must familiarize himself fully with the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of his contract. Insofar as possible the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor.

8. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally. All information given to bidders other than by means of the plans, specifications, or by addenda, as described below, is given informally and shall not be used as the basis of a claim against the Owner.

Every request for such interpretation should be in writing addressed to Sally Woodson, 20 Conant Street, Danvers, MA 01923, swoodson@gienapparchitects.com and to be given consideration must be received at least seven days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, when issued, will be mailed by certified mail with return receipt requested to all prospective bidders (at the respective address furnished by them for such purposes), or sent via facsimile or email if time requires. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the Contract Documents.

9. Security for Faithful Performance

Simultaneously with his delivery of the executed Contract, the Contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor and materials under this contract as specified in Section 00700, GENERAL CONDITIONS included herein. The surety on such bond or bonds shall be a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Owner. The bonds shall remain in force for one year after final acceptance of the work by the Owner, unless the Owner, in writing, releases the Contractor from the obligation sooner.

10. Power of Attorney

Attorneys-in-fact who sign Contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

11. Laws and Regulations

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances or bylaws, and the rules and regulations of all authorities having jurisdiction

over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though written out in full. Attention is directed to Section 00850 and to other applicable sections of the Contract Documents.

12. Liquidated Damages for Failure to Enter into Contract

The successful bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within 10 days after presentation thereof by the Owner, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his/her bid, but the amount forfeited shall not exceed the difference between his/her bid price and the bid price of the next lowest responsible and eligible bidder. In case of death, disability, bona fide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the bidder, his/her bid deposit will be returned.

13. Obligation of Bidder

At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Contract Documents (including all addenda). The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect of his bid.

14. Information Not Guaranteed

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the Owner. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

It is agreed and understood that the Owner does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents.

If is further agreed and understood that no bidder or Contractor shall use or be entitled to use any of the information made available to him or obtained in any examination made by him in any manner as a basis of or ground for any claim or demand against the Owner or the Architect/Engineer, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

15. Bid Security

Each bid and sub-bid must be accompanied by bid security in the form of a certified check, a bid bond, cash, or a treasurer's or cashier's check, payable to the Owner, in the amount of five (5) percent of the value of the bid. Such security of general bidders will be returned to all except the three lowest responsible and eligible bidders within five days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids, and the remaining securities will be returned promptly after the Owner and the accepted bidder have executed the Contract, or if no notice of intent to award has been presented to the selected contractor within 30 days, Saturdays, Sundays and holidays excluded, after the date of the opening of bids, upon demand of the bidder at any time thereafter. Bid security of sub-bidders, except that of the sub-bidders named in the general bids of the three lowest responsible and eligible general bidders and those of the three 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 general bids, the bid security of the sub-bidders not returned as aforesaid, shall be returned within five (5) days, Saturdays, Sundays and legal holidays excluded, after the execution of the General Contract.

16. Right to Reject Bid

The Owner reserves the right to waive any informalities in bids and to reject any and all bids, should the Owner deem it to be in the public interest to do so.

The Owner may also reject bids which in its sole judgment are either incomplete, conditional, obscure or not responsive or which contain additions not called for, erasures not properly initialed, alterations, or similar irregularities.

17. Time for Completion

The successful general bidder must agree to commence work within ten (10) days of the date of the Notice to Proceed and to fully complete the project within the time limit stated in Section 00300, FORM OF GENERAL BID.

18. Comparison of Bids

Bids will be compared on the basis of prices set forth in the bid forms.

In the event that there is a discrepancy between the lump sum or unit prices written in words and figures, the prices written in words will govern.

19. Award of Contract

The Contract will be awarded to "the lowest responsible and eligible bidder" pursuant to General Laws Chapter 149, Section 44A(2), as amended. Such a bidder shall possess the skill, ability and integrity necessary for the faithful performance of the work, shall be able

to furnish labor that can work in harmony with all other elements of labor employed, or to be employed, in the work, and shall otherwise comply with all applicable provisions of law. Contract award shall be subject to availability of an appropriation for funding.

20. Statutes Regulating Competitive Bidding

Any bid which does not comply with the provisions of Massachusetts General Laws Chapter 149, Sections 44A through 44H, as amended, need not be accepted and the Owner may reject every such bid.

21. Wage Rates

Prevailing Wage Rates as determined by the Commissioner of the Department of Labor and Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Section 26 to 27G, as amended, apply to this project. It is the responsibility of the bidder, before bid opening, to request any additional information on Prevailing Wage Rates for those tradespeople who may be employed for the proposed work under this contract.

State schedules of Prevailing wage rates are included in the Supplemental General Conditions section of the Contract Documents.

22. Contractor Records

The Contractor shall comply with the provisions of Massachusetts General Laws, Chapter 30, Section 39R concerning Contractor records.

23. INSURANCE

The Contractor shall carry and continuously maintain until completion of the Contract, insurance as specified in the General Conditions and in such form as shall protect him performing work covered by this Contract, and the City/Town of _____ and its employees, agents and officials, from all claims an liability for damages for bodily injury, including accidental death, and for property damage, which may arise from operations under this Contract. The City/Town shall be named as an additional insured. The Contractor covenants and agrees to hold the City/Town and its employees, agents and officials harmless from loss or damage due to claims for bodily injury or death and/or property damage arising from, or in connection with, operations under this Contract.

25. PROJECT MANAGER

In addition to a project Architect/Engineer, the Owner may utilize the services of a project manager, whose duties shall be as set forth in the Agreement for Project Manager Services.

21. Certificate of Eligibility and Update Statement

In accordance with G.L. c.149, §44D, every bid and sub-bid must be accompanied by a copy of a certificate of eligibility issued by the Division of Capital Asset Management showing that the bidder or sub-bidder has the classification and capacity rating to perform the work required. An appropriate update statement must also be provided with each bid. Any bid or sub-bid submitted without an appropriate certificate of eligibility or update statement shall be invalid.

SECTION 00300

FORM OF GENERAL BID

Bid of _____ (hereinafter called "Bidder")*

(____) a corporation, organized and existing under the laws of the state of _____

(____) a partnership

(____) a joint venture

(____) an individual
doing business as _____

To the City/Town of _____, Massachusetts (hereinafter called "Owner").

Gentlemen:

A) The undersigned Bidder, in compliance with your invitation for bids for the project known as _____, having examined the plans and specifications and related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the contract documents and the plans and specifications within the time set forth below, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the contract documents, of which this bid is a part.

The Bidder hereby agrees to commence work on or before the date to be specified in written "Notice to Proceed" of the Owner, and to substantially complete the project within _____ consecutive calendar days thereafter. The Bidder further agrees to pay as liquidated damages the sum of ($) Dollars for each consecutive calendar day thereafter that the work is not complete as provided in Section 00700 GENERAL CONDITIONS.

_____
*Specify corporation, partnership or individual as applicable.

B) Bidder acknowledges receipt of and this bid includes the following addenda:

No. Dated:

No. Dated:

No. Dated:

No. Dated:

C) The Bidder agrees to perform the work described in the specifications and shown on the plans for the following contract price: $_____ .

For alternate No._____ Add $_____; Subtract $_____

For alternate No._____ Add $_____; Subtract $_____

For alternate No._____ Add $_____; Subtract $_____

For alternate No._____ Add $_____; Subtract $_____

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. $_____

Item 2. Sub-bids as follows:--

Sub-trade	Name of Sub-bidder	Amount	Bonds required, indicated by "Yes" or "No"
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____

Total of Item 2 $_____

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 he is selected as general contractor, he will promptly confer with the awarding authority on the question of sub-bidders; and that the awarding authority may substitute for any sub-bid listed above a sub-bid filed with the awarding authority by another sub-bidder for the sub-trade against whose standing and ability the undersigned makes no objection; and that the undersigned will use all such finally selected sub-bidders at the amounts named in their respective sub-bids and be in every way as responsible for them and their work as if they had been originally named in this general bid, the total contract price being adjusted to conform thereto.

The undersigned agrees that, if he is selected as general contractor, he will within five days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the awarding authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price; provided, however, that if there is more than one surety company, the surety companies shall be jointly and severally liable.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A.

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

The Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids.

Bid security is attached in the sum of five percent (5%) of the total bid in accordance with the conditions of Section 00100 INSTRUCTIONS TO BIDDERS. The bid security may become the property of the Owner in the event the contract and bonds are not executed within the time set forth above.

The selected Contractor shall furnish a performance bond and a payment bond in an amount at least equal to one hundred percent (100%) of the contract price in accordance with Section 00610 PERFORMANCE BOND, Section 00620 PAYMENT BOND, and as stipulated in Section 00700 GENERAL CONDITIONS and any supplemental general conditions thereto.

The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all the requirements of the plans and specifications.

1. Have been in business under present name for ____ years.

2. The names and addresses of all persons interested in the bid (if made by a partnership or corporation) as principals, are as follows:

_____
_____
_____
_____
_____
_____
(attach supplementary list if necessary)

3. The bidder is requested to state below what work of a similar character to that included in the proposed contract he has done, and give references that will enable the Owner to judge his experience, skill and business standing (add supplementary page if necessary).

Completion Date	Project Name	Contract Amount	Design Architect	Reference Name	Telephone No.

a._____

_____

b._____

_____

c._____

_____

d._____

_____

e._____

_____

f._____

_____

Pursuant to M.G.L. C. 62C, Sec. 49A, I certify hereby in writing, under penalties of perjury, that the within named Bidder/Contractor has complied with all laws of the commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting of child support.

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

Respectfully submitted:

Date: _____

By: _____
(Signature)

_____
(Type Name of Bidder)

_____
(Title)

_____
(Business Address)

_____
(City and State)

_____
(Telephone Number)

SECTION 00400

FORM OF SUB-BID

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 the contract sum of _____ dollars ($_____).

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

Alternate No. _____; Add $_____ Subtract $_____

B. This sub-bid includes addenda numbered_____.

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 he is selected as a sub-bidder, he 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 therefor, furnish a performance and payment bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority, in the full sum of the subcontract price.

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

Name	Class of Work	Bid Price
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

[Do not give bid price for any class or part thereof furnished by undersigned.]

F. The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinbefore described plans, specifications and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the awarding authority.

G. The undersigned further agrees to be bound to the general contractor by the terms of the hereinbefore described plans, specifications, including all general conditions stated therein, and addenda, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the owner.

H. The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all the requirements of the plans and specifications:

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

2. Ever failed to complete any work awarded: _____

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

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

4. Bank reference_____

I. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44F.

The undersigned further certifies under penalties of perjury that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Date:_____

_____
(Name of Sub-bidder)

By:_____
(Title and Name of Person
Signing Bid)

_____
(Business Address)

_____
(City and State)

SECTION 00500

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 200_, by and between the party of the first part, the City/Town of _____, hereinafter called "OWNER," acting herein through its _____, and the party of the second part, _____ doing business as *(an individual) (a partnership) (a joint venture) (a corporation) located in the *(City) (Town) of _____, County of _____, and State of _____, hereinafter called "CONTRACTOR."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the project described as follows: _____ _____, hereinafter called the Project, for the sum of _____ _____ Dollars ($_____) and all extra work in connection therewith, under the terms as stated in the Contract Documents; and at his (its or their) own proper cost and expense to furnish all the materials, supplies, machinery equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in Section 00300 FORM OF GENERAL BID, Section 00700 GENERAL CONDITIONS, and Section 00800 SUPPLEMENTAL GENERAL CONDITIONS, the plans, which include all maps, plates, blue prints, and the specifications and Contract Documents as prepared by the Owner.

The CONTRACTOR hereby agrees to commence work under this Contract on or before a date to be specified in written "Notice to Proceed" of the OWNER.

The CONTRACTOR further agrees to substantially complete the project within ____ consecutive calendar days of the date of the notice to proceed.

The CONTRACTOR further agrees to pay as liquidated damages the sum of $_____ for each consecutive calendar day thereafter as provided in the Liquidated Damages Paragraph of Article 8 of Section 00700 GENERAL CONDITIONS.

The CONTRACTOR agrees not to discriminate against or exclude any person from participation herein on grounds of race, religion, color, sex, age or national origin; and that it shall take affirmative actions to ensure that applicants are employed, and that employees are treated during their employment, without regard to race, religion, color, sex, age, handicapped status, or national origin.

The CONTRACTOR agrees not to participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue Code of 1986, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided in Section 00700 GENERAL CONDITIONS, and to make payments on account thereof as provided in Article 9 of Section 00700 GENERAL CONDITIONS.

IN WITNESS WHEREOF, the parties to these presents have executed this contract in two (2) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

AGREED:

CITY/TOWN OF _____, MASSACHUSETTS
(Owner)

By_____

_____
(Name)

_____
(Title)

CONTRACTOR: _____

By_____

_____
(Name)

_____
(Title)

_____
(Address)

_____
(City and State)

Approved as to Form:

By_____
(Owner's Counsel)

In accordance with M.G.L. C.44, Section 31C, this is to certify that an appropriation in the amount of this contract is available therefor and that the _____ has been authorized to execute the contract and approve all requisitions and change orders.

By_____
(Owner's Accountant)

_____
(Name)

CERTIFICATE OF VOTE
(to be filed if Contractor is a Corporation)

I, _____, hereby certify that I am the duly qualified
(Secretary of the Corporation)

and acting Secretary of _____ and I further certify that a meeting of the
(Name of Corporation)

Directors of said Company, duly called and held on _____, at which
(Date of Meeting)

all Directors were present and voting, the following vote was unanimously passed:

VOTED: To authorize and empower

_____

_____

_____

_____

_____

Anyone acting singly, to execute Forms of General Bid, Contracts or Bonds on behalf of the Corporation.

I further certify that the above vote is still in effect and has not been changed or modified in any respect.

By:_____
(Secretary of Corporation)

A True Copy:

Attest:_____
(Notary Public)

My Commission Expires:_____
(Date)

CERTIFICATIONS REQUIRED BY LAW
FOR PUBLIC CONSTRUCTION CONTRACTS

You must COMPLETE and SIGN the following certifications. You must also print, at the bottom of this page, the name of the contractor for whom these certifications are submitted.

TAX COMPLIANCE

Pursuant to Chapter 62C of the Massachusetts General Laws, Section 49A(b), I, the undersigned, authorized signatory for the below named contractor, do hereby certify under the pains and penalties of perjury that said contractor has complied with all laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

NON-COLLUSION

The undersigned 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.

PUBLIC CONTRACTOR DEBARMENT

The undersigned certifies under penalty of perjury that the below named contractor 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.

OSHA TRAINING

Pursuant to G.L. c. 30, §39S, the Contractor hereby certifies under penalties of perjury as follows:

(1) Contractor is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;
(2) 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 they shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and
(3) All employees to be employed in the work subject to this contract 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.

COMPLETE AND SIGN BELOW:

_____ _____
Authorized Person's Signature Date

_____
Print Name & Title of Signatory

_____
Name of Contractor

SECTION 00610

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____
(Name of Contractor)

a _____ hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture or Individual)

_____of _____, State of _____
(Surety) (City & State)

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

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

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

PROVIDED, FURTHER, that the Surety's obligation under this Bond shall arise after (1) the Owner has declared the Principal in default of the Construction Contract or any provision thereof or (2) has declared that the Principal has failed, or is otherwise unable or unwilling, to execute the work consistent with, and in conformance to, the Construction Contract (collectively referred to as a "Contractor Default"). The determination of a Contractor Default shall be made solely by the Owner. The Owner need not terminate the Construction Contract to declare a Contractor Default or to invoke its rights under this Bond.

When the Surety's obligation under this Bond arises, the Surety, at its sole expense and at the consent and election of the Owner, shall promptly take one of the following steps: (1) arrange for the Principal to perform and complete the work of the Construction Contract: (2) arrange for a contractor other than the Principal to perform and complete the work of the Construction Contract; (3) reimburse the Owner, in a manner and at such time as the Owner shall decide, for all costs and expenses incurred by the Owner in performing and completing the work of the Construction Contract. Surety will keep Owner reasonably informed of the progress, status and results of any investigation of any claim of the Owner.

If the Surety does not proceed as provided in this Bond with due diligence and all deliberate speed, the Surety shall be deemed to be in default of this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

After the Surety's obligation under this Bond arises, the Surety is obligated, to the limit of the amounts of this Bond, for (1) the correction of defective work and completion of the Construction Contract; (2) additional design, professional services, and legal costs, including attorneys' fees, resulting from the Contractor Default or from the default of the Surety under this Bond; (3) any additional work beyond the Construction Contract made necessary by the Contractor Default or default of the Surety under this Bond; (4) indemnification obligation of the Principal, if any, as provided in the Construction Contract; and (5) liquidated damages as provided in the Construction Contract, or if none are so specified, actual and foreseeable consequential damages resulting from the Contractor Default or default of the Surety under this Bond.

Any proceeding, legal or equitable, under this Bond shall be instituted in any court of competent jurisdiction in the Commonwealth of Massachusetts.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Construction Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Construction Contract or to the work or to the specifications.

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

ATTEST:

_____
Principal

_____ By _____
(Principal Secretary)

_____

_____

_____
(Address-Zip Code)

_____ (SEAL)
Witness as to Principal

_____

_____
(Address-Zip Code)

ATTEST:

_____
Surety

_____ By _____
(Attorney-in-Fact)

_____

_____
(Address-Zip Code)

_____ (SEAL)
Witness as to Surety

_____

_____
(Address-Zip Code)

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

SECTION 00620

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____

_____ a_____ _____
(Name of Contractor) (Corporation, Partnership, Joint Venture or Individual)

hereinafter called "Principal" and _____ of _____,
(Surety)

State of _____ hereinafter called the "Surety" and licensed by the State
(City and State)

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

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20___, for the construction described as follows:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

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

ATTEST:

_____
Surety

_____ By _____
(Attorney-in-Fact)

_____

_____
(Address-Zip Code)

_____ (SEAL)
Witness as to Surety

_____

_____
(Address-Zip Code)

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

SECTION 00700

GENERAL CONDITIONS

Use AIA A201 (2017 edition)

SECTION 00750

SUPPLEMENTARY CONDITIONS

Insert standard Supplementary General Conditions to AIA A201.

1997 EDITION

AIA DOCUMENT A201-1997

General Conditions of the Contract for Construction

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document has been approved and endorsed by The Associated General Contractors of America.

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AIA DOCUMENT A201-1997
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1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

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ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of Addenda relating to bidding requirements).

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and Contractor, (2) between the Owner and a Subcontractor or Sub-subcontractor, (3) between the Owner and Architect or (4) between any persons or entities other than the Owner and Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

1.1.3 THE WORK

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

1.1.4 THE 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.

1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.1.6 THE SPECIFICATIONS

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

1.1.7 THE PROJECT MANUAL

The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are

complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

1.2.3 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 CAPITALIZATION

1.3.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document or (3) the titles of other documents published by the American Institute of Architects.

1.4 INTERPRETATION

1.4.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.5 EXECUTION OF CONTRACT DOCUMENTS

1.5.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

1.5.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

1.6 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

1.6.1 The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect or the Architect's consultants, and unless otherwise indicated the Architect and the Architect's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights. All copies of Instruments of Service, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in

the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' copyrights or other reserved rights.

ARTICLE 2 OWNER

2.1 GENERAL

2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Subparagraph 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 The Owner shall, at the written request of the Contractor, prior to commencement of the Work and thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Furnishing of such evidence shall be a condition precedent to commencement or continuation of the Work. After such evidence has been furnished, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

2.2.2 Except for permits and fees, including those required under Subparagraph 3.7.1, which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

2.2.4 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.

2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

2.3 OWNER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in

accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period give the Contractor a second written notice to correct such deficiencies within a three-day period. If the Contractor within such three-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

3.1 GENERAL

3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 Since the Contract Documents are complementary, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Subparagraph 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly to the Architect as a request for information in such form as the Architect may require.

3.2.2 Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect, but it is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents. The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, but any nonconformity discovered by or made known to the Contractor shall be reported promptly to the Architect.

3.2.3 If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Architect in response to the Contractor's notices or requests for information pursuant to Subparagraphs 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Subparagraphs 4.3.6 and 4.3.7. If the Contractor fails to perform the obligations of Subparagraphs 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. The Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents unless the Contractor recognized such error, inconsistency, omission or difference and knowingly failed to report it to the Architect.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage.

3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

3.4 LABOR AND MATERIALS

3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, 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.

3.4.2 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order.

3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract

Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

3.6 TAXES

3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

3.7 PERMITS, FEES AND NOTICES

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received or negotiations concluded.

3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work.

3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

3.8 ALLOWANCES

3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

3.8.2 Unless otherwise provided in the Contract Documents:

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances;

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Clause 3.8.2.1 and (2) changes in Contractor's costs under Clause 3.8.2.2.

3.8.3 Materials and equipment under an allowance shall be selected by the Owner in sufficient time to avoid delay in the Work.

3.9 SUPERINTENDENT

3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

3.10.2 The Contractor shall prepare and keep current, for the Architect's approval, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Architect reasonable time to review submittals.

3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record field changes and selections made during construction, and one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

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

3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of Subparagraph 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect without action.

3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by

the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.

3.12.6 By approving and 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, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

3.12.9 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 Architect on previous submittals. In the absence of such written notice the Architect's approval of a resubmission shall not apply to such revisions.

3.12.10 The Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Subparagraph 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

3.13 USE OF SITE

3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.14 CUTTING AND PATCHING

3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

3.15 CLEANING UP

3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16 ACCESS TO WORK

3.16.1 The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

3.17 ROYALTIES, PATENTS AND COPYRIGHTS

3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

3.18 INDEMNIFICATION

3.18.1 To the fullest extent permitted by law and to the extent claims, damages, losses or expenses are not covered by Project Management Protective Liability insurance purchased by the Contractor in accordance with Paragraph 11.3, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be

construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Subparagraph 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

4.1.3 If the employment of the Architect is terminated, the Owner shall employ a new Architect against whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the former Architect.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents, and will be an Owner's representative (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Paragraph 12.2. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

4.2.2 The Architect, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if the Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will neither have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Subparagraph 3.3.1.

4.2.3 The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

4.2.4 Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

4.2.6 The Architect will have authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Subparagraphs 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

4.2.7 The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 7.4.

4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion, will receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor.

The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and initial decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.

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

4.3 CLAIMS AND DISPUTES

4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 Time Limits on Claims. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be initiated by written notice to the Architect and the other party.

4.3.3 Continuing Contract Performance. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Subparagraph 9.7.1 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

4.3.4 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Paragraph 4.4.

4.3.5 Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.6.

4.3.6 If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claim shall be filed in accordance with this Paragraph 4.3.

4.3.7 CLAIMS FOR ADDITIONAL TIME

4.3.7.1 If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

4.3.7.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

4.3.8 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

4.3.9 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

4.3.10 Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Subparagraph 4.3.10 shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

4.4 RESOLUTION OF CLAIMS AND DISPUTES

4.4.1 Decision of Architect. Claims, including those alleging an error or omission by the Architect but excluding those arising under Paragraphs 10.3 through 10.5, shall be referred initially to the Architect for decision. An initial decision by the Architect shall be required as a

condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered by the Architect. The Architect will not decide disputes between the Contractor and persons or entities other than the Owner.

4.4.2 The Architect will review Claims and within ten days of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Architect is unable to resolve the Claim if the Architect lacks sufficient information to evaluate the merits of the Claim or if the Architect concludes that, in the Architect's sole discretion, it would be inappropriate for the Architect to resolve the Claim.

4.4.3 In evaluating Claims, the Architect may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Architect in rendering a decision. The Architect may request the Owner to authorize retention of such persons at the Owner's expense.

4.4.4 If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either provide a response on the requested supporting data, advise the Architect when the response or supporting data will be furnished or advise the Architect that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Architect will either reject or approve the Claim in whole or in part.

4.4.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefor and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be final and binding on the parties but subject to mediation and arbitration.

4.4.6 When a written decision of the Architect states that (1) the decision is final but subject to mediation and arbitration and (2) a demand for arbitration of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

4.4.7 Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect or the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Architect or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.4.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines prior to resolution of the Claim by the Architect, by mediation or by arbitration.

4.5 MEDIATION

4.5.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5 shall, after initial decision by the Architect or 30 days after submission of the Claim to the Architect, be

subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.

4.5.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

4.5.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

4.6 ARBITRATION

4.6.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.10, 9.10.4 and 9.10.5, shall, after decision by the Architect or 30 days after submission of the Claim to the Architect, be subject to arbitration. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Paragraph 4.5.

4.6.2 Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect. The demand for arbitration shall be filed in writing with the other party to the Contract and with the American Arbitration Association, and a copy shall be filed with the Architect.

4.6.3 A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.4.6 and 4.6.1 as applicable, and in other cases within a reasonable time after the Claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.

4.6.4 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract shall include, by consolidation or joinder or in any other manner, the Architect, the Architect's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a Claim not described therein or with a person or entity not named or described therein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

4.6.5 **Claims and Timely Assertion of Claims.** The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

4.6.6 **Judgment on Final Award.** The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

ARTICLE 5 SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitute.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the

Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Paragraph 4.3.

6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the

Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

6.2.3 The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Subparagraph 10.2.5.

6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Subparagraph 3.14.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

7.1 GENERAL

7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

7.2 CHANGE ORDERS

7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect, stating their agreement upon all of the following:

.1 change in the Work;

.2 the amount of the adjustment, if any, in the Contract Sum; and

.3 the extent of the adjustment, if any, in the Contract Time.

7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Subparagraph 7.3.3.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 unit prices stated in the Contract Documents or subsequently agreed upon;

.3 cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 as provided in Subparagraph 7.3.6.

7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clause 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph 7.3.6 shall be limited to the following:

.1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 additional costs of supervision and field office personnel directly attributable to the change.

7.3.7 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

7.3.8 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect will make an interim determination for purposes of monthly certification for payment for those costs. That determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a claim in accordance with Article 4.

7.3.9 When the Owner and Contractor agree with the determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

7.4 MINOR CHANGES IN THE WORK

7.4.1 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8 TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

8.1.2 The date of commencement of the Work is the date established in the Agreement.

8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Paragraph 9.8.

8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.2 PROGRESS AND COMPLETION

8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by the Contract Documents or a notice to proceed given

by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of morgages, mechanic's liens and other security interests.

8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner pending mediation and arbitration, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3.

8.3.3 This Paragraph 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for operations completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for in the Contract Documents.

9.3.1.1 As provided in Subparagraph 7.3.8, such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

9.3.1.2 Such applications may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1.

9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Subparagraph 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Subparagraph 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's

opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 3.3.2, because of:

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or another contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 persistent failure to carry out the Work in accordance with the Contract Documents.

9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.6 PROGRESS PAYMENTS

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

9.6.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

9.6.4 Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law.

9.6.5 Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3 and 9.6.4.

9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

9.7 FAILURE OF PAYMENT

9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by arbitration, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Clause 11.4.1.5 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and

have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that

portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

.1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents; or

.3 terms of special warranties required by the Contract Documents.

9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

10.3 HAZARDOUS MATERIALS

10.3.1 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

10.3.2 The Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. The Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up, which adjustments shall be accomplished as provided in Article 7.

10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Subparagraph 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) and provided that such damage, loss or expense is not due to the sole negligence of a party seeking indemnity.

10.4 The Owner shall not be responsible under Paragraph 10.3 for materials and substances brought to the site by the Contractor unless such materials or substances were required by the Contract Documents.

10.5 If, without negligence on the part of the Contractor, the Contractor is held liable for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

10.6 EMERGENCIES

10.6.1 In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or

extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

.2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 claims for damages insured by usual personal injury liability coverage;

.5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 claims for bodily injury or property damage arising out of completed operations; and

.8 claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

11.3 PROJECT MANAGEMENT PROTECTIVE LIABILITY INSURANCE

11.3.1 Optionally, the Owner may require the Contractor to purchase and maintain Project Management Protective Liability insurance from the Contractor's usual sources as primary coverage for the Owner's, Contractor's and Architect's vicarious liability for construction operations under the Contract. Unless otherwise required by the Contract Documents, the Owner

shall reimburse the Contractor by increasing the Contract Sum to pay the cost of purchasing and maintaining such optional insurance coverage, and the Contractor shall not be responsible for purchasing any other liability insurance on behalf of the Owner. The minimum limits of liability purchased with such coverage shall be equal to the aggregate of the limits required for Contractor's Liability Insurance under Clauses 11.1.1.2 through 11.1.1.5.

11.3.2 To the extent damages are covered by Project Management Protective Liability insurance, the Owner, Contractor and Architect waive all rights against each other for damages, except such rights as they may have to the proceeds of such insurance. The policy shall provide for such waivers of subrogation by endorsement or otherwise.

11.3.3 The Owner shall not require the Contractor to include the Owner, Architect or other persons or entities as additional insureds on the Contractor's Liability Insurance coverage under Paragraph 11.1.

11.4 PROPERTY INSURANCE

11.4.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.4 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

11.4.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

11.4.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

11.4.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

11.4.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

11.4.1.5 Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial

occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.4.2 **Boiler and Machinery Insurance.** The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

11.4.3 **Loss of Use Insurance.** The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

11.4.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

11.4.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Subparagraph 11.4.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

11.4.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Paragraph 11.4. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

11.4.7 **Waivers of Subrogation.** The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Paragraph 11.4 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

11.4.8 A loss insured under Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Subparagraph 11.4.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

11.4.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.6. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

11.4.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved as provided in Paragraphs 4.5 and 4.6. The Owner as fiduciary shall, in the case of arbitration, make settlement with insurers in accordance with directions of the arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

11.5 PERFORMANCE BOND AND PAYMENT BOND

11.5.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

11.5.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2 If a portion of the Work has been covered which the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

12.2 CORRECTION OF WORK

12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

12.2.1.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2.1 In addition to the Contractor's obligations under Paragraph 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Paragraph 2.4.

12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work.

12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Paragraph 12.2.

12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.5 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1.1 The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Subparagraph 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.2.2 The Owner may, without consent of the Contractor, assign the Contract to an institutional lender providing construction financing for the Project. In such event, the lender shall assume the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

13.3 WRITTEN NOTICE

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Subparagraph 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Subparagraph 13.5.3, shall be at the Owner's expense.

13.5.3 If such procedures for testing, inspection or approval under Subparagraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6 INTEREST

13.6.1 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1 As between the Owner and Contractor:

.1 **Before Substantial Completion.** As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;

.2 **Between Substantial Completion and Final Certificate for Payment.** As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and

.3 **After Final Certificate for Payment.** As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provided under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 issuance of an order of a court or other public authority having jurisdiction which requires all Work to be stopped;

.2 an act of government, such as a declaration of national emergency which requires all Work to be stopped;

.3 because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Subparagraph 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 the Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Subparagraph 2.2.1.

14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Paragraph 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

14.1.3 If one of the reasons described in Subparagraph 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages.

14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.3.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

.1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 accept assignment of subcontracts pursuant to Paragraph 5.4; and

.3 finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

14.2.3 When the Owner terminates the Contract for one of the reasons stated in Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Subparagraph 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

TOWN OF BOXFORD

ADDENDUM TO SUPPLEMENTARY CONDITIONS

Amending the General Conditions of the Contract for Construction.
AIA Document A201 (1997 edition)

I. THE ADDENDUM TO SUPPLEMENTARY CONDITIONS

The following addendum supplements, modifies, deletes and/or adds to the General Conditions and Supplementary Conditions. Where any Article, Paragraph or subparagraph in the General Conditions or Supplementary Conditions is supplemented by one of the following paragraphs, the provisions of such Article, Paragraph, or Subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any Article, Paragraph, or subparagraph in the General Conditions or Supplementary Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such Article, Paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.

II. MODIFICATIONS TO VARIOUS ARTICLES OF THE AIA CONDITIONS

ARTICLE 1: GENERAL PROVISIONS

1.1.1 In the third sentence delete the words "Unless specifically enumerated in the Agreement," and the word "not".

1.2.1 Add the following at the end of subparagraph 1.2.1:

All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others. Should the Drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quantity of Work unless otherwise directed by written addendum to the Contract.

1.2.2 Add the following to subparagraph 1.2.2:

The performance of filed sub-trade work shall comply with the provisions of chapter 149 of the General Laws of the Commonwealth of Massachusetts. The Contractor and all Subcontractors shall refer to all of the Drawings, including those showing primarily the Work of the mechanical, electrical and other specialized trades, and to all of the Sections of the Specifications, and shall perform all Work reasonably inferable therefrom as being necessary to produce the indicated results.

1.2.4-
1.2.11 Add new subparagraphs 1.2.4 through 1.2.11 as follows:

1.2.4 All indications or notations which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents.

1.2.5 Where codes, standards, requirements and publications of public and private bodies are referred to in the Specifications, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated.

1.2.6 Where no explicit quality or standards for materials or workmanship are established for Work, such Work is to be of good quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.

1.2.7 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.

1.2.8 The Mechanical, Electrical and Fire Protection Drawings are diagrammatic only, and are not intended to show the alignment, physical locations or configurations of such Work. Such Work shall be installed without additional cost to the Owner to clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. Prior to beginning such Work, the Contractor shall prepare coordination drawings showing the exact alignment, physical location and configuration of the Mechanical, Electrical and Fire Protection installations and demonstrating to the Contractor's satisfaction that the installations will comply with the preceding sentence.

1.2.9 Exact locations of fixtures and outlets shall be obtained from the Architect as provided in subparagraph 3.2.1 before the Work is roughed in; Work installed without such information from the Architect shall be relocated at the Contractor's expense.

1.2.10 Test boring or soil test information included with the Contract Documents or otherwise made available to the Contractor was obtained by the Owner for use by the Architects in the design of the Project or Work. The Owner does not hold out such information to the Contractor as an accurate or approximate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed except as provided in subparagraph 4.3.4.

1.2.11 Where the Work is to fit with existing conditions or work to be performed by others, the Contractor shall fully and completely join the Work with such conditions or work, unless otherwise specified.

1.5.2: Delete the word “generally” in line 2.

1.6.1 Delete subparagraph 1.6.1 in its entirety and insert the following:

All Drawings, Specifications and copies thereof furnished by the Owner are and shall remain the Owner's property. They are to be used only with respect to this Project and are not to be used on any other project without the prior written consent of the Owner. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Owner at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights.

ARTICLE 2: OWNER

2.1.2 Delete subparagraph 2.1.2 in its entirety.

2.2.1 Delete the second and third sentences.

2.2.3 In the first line of subparagraph 2.2.3 insert the word "available" after the word "furnish".

Delete all text after the word “Owner” in line 3 and insert the following:

except to the extent that the Contractor’s review thereof reveals, or in the exercise of reasonable diligence should have revealed, any inaccuracy or incompleteness therein. The Contractor shall exercise proper precautions relating to the safe performance of the Work.

2.2.4 Delete the second sentence.

2.2.5 In the second line of subparagraph 2.2.5 delete the word "such" and insert "[no. of contracts to be provided by Contractor]".

Add the following to the end of subparagraph 2.2.5: ", all additional copies will be furnished upon request at the cost of reproduction."

2.3.1 Add the following to the end of subparagraph 2.3.1:

The Contractor shall resume the Work after such stoppage promptly upon written notice to do so from the Owner. If such stoppage is required through no fault of the Contractor, the Contract Time (and the dates for achieving Substantial Completion and Final Completion) shall be extended by a period equal to the period of the stoppage, and the

Contractor shall be compensated for its reasonable and justifiable costs incurred as a result of such stoppage.

2.4.1 Delete the following words in subparagraph 2.4.1 beginning in line four:

"the Owner may after such seven-day period give the Contractor a second written notice...fails to commence and continue to correct any deficiencies,"

Delete the fourth sentence.

ARTICLE 3: CONTRACTOR

3.2.1 Delete the second sentence of subparagraph 3.2.1.

3.2.2 Insert a period after the word "Architect" in line 2, delete the balance of subparagraph 3.2.2 and substitute the following:

The Contractor shall not be liable to the Owner or Architect for damage resulting from errors, inconsistencies or omissions in the Contract Documents, but shall be liable for damage to the extent he reasonably should have, but failed to, discover such error, inconsistency or omission. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for such correction.

3.2.3 Delete the third sentence.

3.2.4 Add new paragraph as follows:

3.2.4 Any claim by the Contractor or Subcontractors that, in submitting their respective bids, they did not include all items as shown in the Contract Documents, will be given no consideration for an adjustment of any kind. If any item is specified in a Section which would not normally furnish this items it shall be the responsibility of the Contractor to coordinate the situation with the Subcontractor, and if the item under consideration is not to be provided by the Subcontractor it shall be the responsibility of the Contractor to provide the work in question, without any additional cost to the Owner.

3.3.1 Add the following to the end of the first sentence in subparagraph 3.3.1:

"which shall not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location."

Delete the last sentence.

3.3.2 Add the following to the end of subparagraph 3.3.2:

"This obligation shall also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the Work."

3.5.1 Add the following to the end of the first sentence of subparagraph 3.5.1:

"and, promptly after written notification of non-conformance, shall be repaired or replaced by the Contractor with Work conforming to such requirements."

Insert the word “or” after “maintenance” in line 8 and delete the balance of the second sentence after “operation” in line 8.

3.5.2 -
3.5.8 Add new subparagraphs 3.5.2 through 3.5.8 as follows:

3.5.2 The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect, would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at the Contractor's expense.

3.5.3 If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval.

3.5.4 In informing the Architect of deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.

3.5.5 Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner or the Architect.

3.5.6 The warranty provided in this paragraph 3.5 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.

3.5.7 The Contractor shall procure and deliver to the Architect, no later than the date claimed by the Contractor as the date of Substantial Completion, all special warranties required by the Contract Documents. Delivery by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranty will be performed in accordance with its terms and conditions.

3.5.8 The Contractor shall guarantee all Work for a period of one year after Date of Substantial Completion, or by the terms of any special guarantee required by the Contract Documents. The Contractor shall, upon written notice from the Owner, promptly correct defective Work or Work not in accordance with the Contract Documents.

3.6.1 Add the following:

3.6.1 The project is exempt from the Massachusetts Sales Tax to the extent permitted by G.L. c.64H, §6(f). The exemption number can be obtained from the Awarding Authority upon request by the successful bidder.

3.7.3 Delete the first sentence of subparagraph 3.7.3 and delete the word "However" from the second sentence.

3.7.4 In the first sentence of subparagraph 3.7.4 delete the word "knowing" and insert the following after the word "it":

"knows or should know".

3.8 Delete paragraph 3.8 in its entirety.

3.9.1 In the second line of subparagraph 3.9.1 insert the following after the words "Project site":

"at all times".

3.9.2 -
3.9.3 Add new subparagraphs 3.9.2 and 3.9.3 as follows:

3.9.2 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

3.9.3 The Contractor shall arrange for and attend job meetings with the Architect and such other persons as the Architect may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's own superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings if the representative's presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives.

3.12.6 Add the following at the end of subparagraph 3.12.6:

By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals the Contractor thereby represents that the Contractor has determined and verified all dimensions, quantities, field dimensions, relations to existing work, coordination with work to be installed later, coordination with information on previously accepted Shop Drawings, Product Data, Samples, or similar submittals and verification of compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, Samples, and similar submittals the Architect shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.

3.18.1 Delete the text following the word “and” in line 1 through the words “Paragraph 11.3" in line 3.

Delete the phrase “(other than the Work itself)” in line 8.

Insert the words “or wrongful” after the word “negligent” in line 8.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.1.2 In the first sentence of subparagraph 4.1.2 delete the word "Contractor".

4.1.3 Delete this subparagraph in its entirety.

4.2.11 Add the following to subparagraph 4.2.11:

The parties agree that the Architect’s duties under this subparagraph shall be governed by Chapter 30, Section 39P of the General Laws of the Commonwealth of Massachusetts, as amended.

4.2.12 Delete the second sentence.

4.3.2 Change the words “either party” in line 1 to “the Contractor.” Change the words “other party” in line 4 to “the Owner.”

4.3.4 Delete the text of subparagraph 4.3.4 and substitute the following:

Claims for concealed or unknown conditions shall be governed by Chapter 30, Section 39N of the General Laws of the Commonwealth of Massachusetts, as amended.

4.3.7.2 Delete subparagraph 4.3.7.2

4.3.10 Delete this subparagraph in its entirety.

4.4.5 Revise the second sentence of subparagraph 4.4.5 to read:

"The approval or rejection of a Claim by the Architect shall be final and binding on the parties but subject to final dispute resolution in accordance with the terms of this Contract.

Add the following sentence to the end of subparagraph 4.4.5:

"The provisions of this paragraph 4.4 shall not prevent the parties from pursuing such other remedies as may be available at law if they are not satisfied with the Architect's decision."

4.4.6 Delete this subparagraph in its entirety.

4.4.8 Delete the text after the word “Architect” in line 3.

4.5-
4.6 Delete paragraphs 4.5 and 4.6 in their entirety. The parties may pursue claims in a court of competent jurisdiction and subject to the requirements of the Contract Documents. The use of any other or alternative means of dispute resolution, including mediation and arbitration, shall require the consent of both parties.

ARTICLE 5: SUBCONTRACTORS

5.2.1 Delete the last sentence of subparagraph 5.2.1.

5.2.2 Insert the following after the words"made reasonable" in the second sentence: "and legally permissible".

5.2.3 Delete sentence two and three of subparagraph 5.2.3.

5.3.1 Add at the end of subparagraph 5.3.1:

The applicable provisions of Chapter 149, Section 44F of the General Laws of the Commonwealth of Massachusetts shall apply to filed sub-bid subcontractors.

5.4.2 Delete subparagraph 5.4.2 in its entirety.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1.1 In sentence one of subparagraph 6.1.1 delete the following: "including those portions related to insurance and waiver of subrogation".

6.1.4 Delete subparagraph 6.1.4 in its entirety.

6.2.3 Delete the second sentence.

6.2.5 Delete subparagraph 6.2.5 in its entirety.

ARTICLE 7: CHANGES IN THE WORK

7.2.2 Revise subparagraph 7.2.2 to read as follows:

Unless otherwise provided in the Contract Documents, methods used in determining adjustments to the Contract Sum shall include those listed in subparagraph 7.3.3.

7.2.3 Add the following as new subparagraph 7.2.3:

7.2.3 Upon request of the Owner or the Architect, the Contractor shall without cost to the Owner submit to the Architect, in such form as the Architect may require, an accurate written estimate of the cost of any proposed extra Work or change. The estimate shall indicate the quantity and unit cost of each item of materials, and the number of hours of work and hourly rate for each class of labor, as well as the description and amounts of all other costs chargeable under the terms of this Article. Unit labor costs for the installation of each item of materials shall be shown if required by the Architect. The Contractor shall promptly revise and resubmit each estimate if the Architect determines that it is not in compliance with the requirements of this Article, or that it contains errors of fact or mathematical errors. If required by the Architect, in order to establish the exact cost of new Work added or of previously required Work omitted, the Contractor shall obtain and furnish to the Architect bona fide proposals from recognized suppliers for furnishing any material included in such Work. Such estimates shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the Contractor's expense. The Contractor shall state in the estimate any extension of time required for the completion of the Work if the change or extra work is ordered.

7.3.8 Delete the second and third sentences.

ARTICLE 8: TIME

8.3.1 Change the phrase "other causes beyond the Contractor's control" in line 4 to read "other causes (except weather) beyond the Contractor's control".

Delete the words "pending mediation and arbitration" in line five.

Add at the end: “, and this shall be the Contractor’s sole remedy for such delay.”

8.3.3 Delete subparagraph 8.3.3 in its entirety.

8.4 Add the following paragraph 8.4

8.4 LIQUIDATED DAMAGES

8.4.1 It is expressly understood and agreed, by and between the Contractor and Owner, that the time for the completion of the Work described herein is a reasonable time for the completion of same, taking into consideration the average climatic range and usual industrial and/or residential conditions prevailing in this locality. If the said Contractor shall neglect, fail or refuse to complete the Work within the times herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner $500.00 not as a penalty but as liquidated damages for such breach of contract, for each and every calendar day that the Contractor shall be in default after the time stipulated for completing the Work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be deducted by the Owner from periodic payments.

ARTICLE 9: PAYMENTS AND COMPLETION

9.3.1.1 Delete this subparagraph.

9.6.5 Delete this subparagraph.

9.6.7 Delete this subparagraph.

9.6.8 Add the following subparagraph 9.6.8 as follows:

9.6.8 Notwithstanding the provisions of paragraph 9.6 all progress payments shall be made in accordance with Chapter 30, Sections 39F and 39K of the General Laws of the Commonwealth of Massachusetts, as amended.

9.7 Delete paragraph 9.7.

9.8.5 Delete this subparagraph and substitute the following:

The Certificate of Substantial Completion shall be submitted to the Owner and Contractor by the Architect. The certificate shall state the date of substantial completion, shall state any consequent responsibilities of the Contractor and the Owner in accordance with the Contract Documents and shall fix the time within which the Contractor shall complete or correct any incomplete or defective work.

9.9.1 In the first sentence of subparagraph 9.9.1 delete the words “when such portion is designated by separate agreement with the Contractor” and “consented to by the insurer as required under Clause 11.4.1.5. and”.

9.10.4 Delete this subparagraph.

9.10.6 Add the following subparagraph:

9.10.6 Notwithstanding anything in the Contract Documents to the contrary, final payment shall be made in accordance with the requirements of G.L.c.30, 39K. as amended.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.2.5 In line six of the first sentence of subparagraph 10.2.5 insert the word "solely" after the word "attributable". Delete the phrase “or by anyone for whose acts either of them may be liable,” in lines 7 and 8, and insert the words “either in whole or in part” after “attributable” in line 8.

10.2.8 - 10.2.11 Add new subparagraphs 10.2.8 through 10.2.11 as follows:

10.2.8 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshall. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

10.2.9 The Contractor shall at all times protect excavations, trenches, buildings and materials from rain water, groundwater, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.

10.2.10 The Contractor shall remove snow and ice which might result in damage or delay.

10.2.11 During the progress of the Work and at all times prior to the date of Substantial Completion or occupancy of the Work by the Owner, whichever is earlier, the Contractor

shall provide temporary heat, ventilation, and enclosure, adequate to permit the Work to proceed in a timely fashion, and to prevent damage to completed Work or Work in progress, or to materials stored on the premises.

10.3.1 Delete this subparagraph in its entirety and substitute the following:

If the Contractor encounters or recognizes on the site any material known or reasonably believed to be hazardous, including but not limited to asbestos or polychlorinated biphenyl (PCB), the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Contractor and the Owner shall cooperate in implementing measures to remove or contain said material and the Contractor shall comply with all directions of the Architect in the implementation of such removal or containment.

10.3.2 Delete this subparagraph in its entirety.

10.3.3 Delete this subparagraph in its entirety.

10.4 -
10.5 Delete these paragraphs in their entirety.

ARTICLE 11: INSURANCE

11.1.2 Change subparagraph 11.1.2 to read as follows:

11.1.2 The insurance required by subparagraph 11.1.1 shall include all major divisions of coverage, and shall be on a comprehensive general basis including Premises and Operations (including X-C-U), Owner's and Contractor's Protective, Products and Completed Operations, and Owned, Non-owned, and Hired Motor Vehicles. Such insurance shall be written for not less than any limits of liability required by law or those set forth in the Contract Documents, whichever is greater.

All insurance shall be written on an occurrence basis, unless the Owner approves in writing coverage on a claims-made basis. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment. The Owner shall be added as an Additional Insured on all policies.

Coverage for such liability insurance shall be provided by a company or companies acceptable to the Owner and authorized to do business in Massachusetts. The Contractor shall furnish to Owner written confirmation as to the insurance carrier's most current financial ratings prior to commencing work.

11.1.3 Add the following at the end of the second sentence of subparagraph 11.1.3.

These certificates shall set forth evidence of all coverage required by 11.1.1 and 11.1.2. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending limits of coverage.

11.2.1 Delete this subparagraph and substitute the following:

The Contractor shall procure and pay for an Owner's policy of Owner's protective liability insurance insuring the Owner and its officers, employees and agents against claims which may arise from operations under the Contract or relating thereto.

11.3 Delete this paragraph in its entirety.

11.4.1-11.4.4 Delete subparagraphs 11.4.1 through 11.4.4 and insert the following subparagraph 11.4.1:

11.4.1 The Contractor shall purchase and maintain property insurance upon the entire Work at the site to the full insurable value thereof. Coverage for such liability insurance shall be provided by a company or companies acceptable to the Owner and authorized to do business in Massachusetts. The Contractor shall furnish to Owner written confirmation as to the insurance carrier's most current financial ratings prior to commencing work. Such insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the work and shall insure against the perils of fire and extended coverage and shall include "all risks" insurance for physical loss or damage including without duplication, theft, vandalism and malicious mischief. This insurance shall also cover portions of the Work stored off the site or in transit. If this insurance is written with stipulated amounts deductible, the Owner shall not be responsible for any difference between the payments made by the insurance carrier and the claim. The policy shall contain a provision that coverages afforded under policies will not be canceled or allowed to expire until at least 30 days' written notice has been given to the Owner. The Owner shall be named insured within the policy.

11.4.5-11.4.7 Delete subparagraphs 11.4.5 through 11.4.7 in their entirety.

11.4.8 Delete the first sentence of subparagraph 11.4.8.

11.4.9-11.4.10 Delete subparagraphs 11.4.9 and 11.4.10 in their entirety and substitute the following:

The Owner shall have the power to adjust and settle with its insurers any loss for which it has obtained insurance.

Upon the occurrence of an insured loss, the Owner and the Contractor shall cooperate with each other and with each other's insurer in the submission of claims and related information and the distribution of any insurance proceeds. If after such a loss no other

special agreement is made, replacement of damaged work shall be covered by an appropriate change order.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.1 Add at the end of subparagraph 12.2.1:

"The Contractor shall bear the cost of any cost, loss, or damages to the Owner resulting from such failure or defect."

12.2.2.1 Delete the third sentence.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.2.1 Delete the phrase “Except as provided in Section 13.2.2,” from the second sentence.

13.2.2 Delete this subparagraph.

13.5.4 Change subparagraph 13.5.4 to read as follows:

13.5.4 The Contractor shall obtain and deliver promptly to the Architect any occupancy permit and any certificates of final inspection of any part of the Contractor's work and operating permits for any mechanical apparatus, such as elevators, escalators, boilers, air compressors, etc., which may be required by law to permit full use and occupancy of the premises by the Owner. Receipt of such permits or certificates by the Architect shall be a condition precedent to Substantial Completion of the Work.

13.7 Delete Paragraph 13.7.

13.8 Add new Paragraph 13.8.

13.8 LIMITATION OF LIABILITY

13.8.1 The Owner shall be liable, if ever, only to the extent of its interest in the Project; and no officer, director, partner, agent or employee of the Owner shall ever be personally or individually liable with respect to this Contract or the Work. Each Subcontract shall include the foregoing limitation, which shall be effective if the Owner ever succeeds to the Contractor's rights and obligations under a Subcontract.

13.9 Add new Paragraph 13.9

13.9 DEFENSE OF SUITS

13.9.1 The Contractor shall be responsible for, shall defend and pay all costs, attorneys' fees and liabilities both direct and indirect as a result of suits arising out of this Contract.

13.9.2 Neither final acceptance nor occupation of the premises by the Owner shall relieve the Contractor of responsibility for all claims for labor, materials, and equipment arising out of this contract.

13.9.3 The Contractor shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses, and expenses including attorneys' fees arising out of or resulting from the performance of the work.

ARTICLE 14: TERMINATION OF THE CONTRACT

14.1.1.1 -
14.1.1.4 Delete subparagraphs 14.1.1.1, 14.1.1.2 and 14.1.1.4

14.1.2 Delete this subparagraph in its entirety.

14.1.3 Revise subparagraph 14.1.3 as follows:

If one of the above reasons exists, the Contractor may, upon seven additional days written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for the Work executed and for all materials or equipment not incorporated in the Work, but delivered and suitably stored at the site. The payment for materials or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to the Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interest.

14.1.4 Delete this subparagraph.

14.2.2 Delete the phrase ", upon certification by the Architect that sufficient cause exists to justify such action," in lines 1 and 2. Delete the last sentence of item .3.

14.2.2.3 Delete the second sentence of this subparagraph.

14.4.3 Delete subparagraph 14.4.3 and substitute the following:

In the event that the Contract is terminated pursuant to paragraph 14.1, the Contractor shall be reimbursed in accordance with the Contract Documents for all Work performed up to the termination date, and for all materials or equipment not incorporated in the Work, but delivered and suitably stored at the site. Payment for materials or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to the Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interest.

SECTION 00800

SPECIAL CONDITIONS

Page

§ SC 1.1 INTRODUCTION

The following provisions modify, change, delete from or add to Section 00700 GENERAL CONDITIONS. Where any Subsection of the General Conditions is modified or any Article Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplemental General Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

§ SC 2.1 PREVAILING WAGES

In accordance with General Laws Chapter 149, Section 26 through 27D, the Contractor is obligated to comply with the prevailing wage rates established by the Commissioner of the Department of Labor and Workforce Development for mechanics, apprentices, chauffeurs, teamsters and laborers employed on the Project. The schedule of applicable prevailing wage rates for the Project, together with a Certificate of Compliance therewith, are set forth in Attachment A herein.

§ SC 3.1 CONTRACTOR'S LIABILITY INSURANCE

In no case shall the limits of liability be less than the following:

1. Contractor's Liability Insurance

a. Workers' Compensation:

1. State: Statutory

2. Employer Liability:

$1,000,000 Bodily Injury by Accident
$3,000,000 Bodily Injury by Disease - policy limit

3. $1,000,000 Bodily Injury by Disease - each
$2,000,000 Umbrella Liability - all limits

b. Comprehensive General Liability (including Premises-Operations; Independent Contractor's Protective; Products and Completed Operations; Broad Form Property Damage):

1. Bodily Injury:
$1,000,000 Each Occurrence
$3,000,000 Aggregate

2. Products and Completed Operations
$1,000,000 Each Occurrence (bodily injury and property damage)
$3,000,000 Aggregate

3. Property Damage Liability (including coverage for XCU hazards).
$1,000,000 Each Occurrence
$3,000,000 Aggregate

4. Products and Completed Operations insurance shall be maintained for a minimum period of 2 years after final payment and Contractor shall continue to provide evidence of such coverage to Owner on an annual basis during the aforementioned.

5. Contractual Liability (Hold Harmless Coverage):
$1,000,000 Bodily Injury Each Occurrence
$1,000,000 Property Damage Each Occurrence
$3,000,000 Property Damage Aggregate

6. Personal Injury, with Employment Exclusion deleted:
$1,000,000 All Limits

c. Comprehensive Automobile Liability (owned, non-owned, hired):

1. Bodily Injury
$1,000,000 Each Person
$1,000,000 Each Accident

2. Property Damage
$1,000,000 Each Accident

d. Builders Risk: TOWN WILL PROVIDE

e. Umbrella Liability Coverage
$2,000,000 All Limits

SECTION 00850

Incorporation of Applicable Provisions of the
Massachusetts General Laws

Certain provisions of the Massachusetts General Laws are applicable to Construction contracts including, but not limited to, those contained in Chapter 30 and Chapter 149. All applicable provisions of the Massachusetts General Laws are incorporated into the Contract as if fully set forth herein, and shall prevail over any conflicting provisions of the General or Supplemental General Conditions.

"ATTACHMENT A"
[Wage Rates]

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

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

ROSALIN ACOSTA
Secretary

MICHAEL FLANAGAN
Director

Awarding Authority: Town of Boxford

Contract Number:

City/Town: BOXFORD

Description of Work: Boxford Town Hall HVAC Project includes upgrading the HVAC system; various exterior repairs including masonry and flashing, and interior renovations including partition changes, finishes & ceilings

Job Location: 7A Spofford Road, Boxford, MA

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Issue Date: 07/09/2020 **Wage Request Number:** 20200709-010

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2020	$35.15	$12.41	$13.72	$0.00	$61.28
	08/01/2020	$35.15	$12.91	$13.72	$0.00	$61.78
	12/01/2020	$35.15	$12.91	$14.82	$0.00	$62.88
	06/01/2021	$35.95	$12.91	$14.82	$0.00	$63.68
	08/01/2021	$35.95	$13.41	$14.82	$0.00	$64.18
	12/01/2021	$35.95	$13.41	$16.01	$0.00	$65.37
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2020	$35.22	$12.41	$13.72	$0.00	$61.35
	08/01/2020	$35.22	$12.91	$13.72	$0.00	$61.85
	12/01/2020	$35.22	$12.91	$14.82	$0.00	$62.95
	06/01/2021	$36.02	$12.91	$14.82	$0.00	$63.75
	08/01/2021	$36.02	$13.41	$14.82	$0.00	$64.25
	12/01/2021	$36.02	$13.41	$16.01	$0.00	$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2020	$35.34	$12.41	$13.72	$0.00	$61.47
	08/01/2020	$35.34	$12.91	$13.72	$0.00	$61.97
	12/01/2020	$35.34	$12.91	$14.82	$0.00	$63.07
	06/01/2021	$36.14	$12.91	$14.82	$0.00	$63.87
	08/01/2021	$36.14	$13.41	$14.82	$0.00	$64.37
	12/01/2021	$36.14	$13.41	$16.01	$0.00	$65.56
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2019	$102.78	$9.90	$21.15	$0.00	$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 2*	06/01/2020	$34.81	$8.60	$15.77	$0.00	$59.18
	12/01/2020	$35.70	$8.60	$15.77	$0.00	$60.07
	06/01/2021	$36.62	$8.60	$15.77	$0.00	$60.99
	12/01/2021	$37.53	$8.60	$15.77	$0.00	$61.90
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	06/01/2020	$38.00	$12.50	$8.85	$0.00	$59.35
	12/01/2020	$39.00	$12.50	$8.85	$0.00	$60.35
ASPHALT RAKER *LABORERS - ZONE 2*	06/01/2020	$34.31	$8.60	$15.77	$0.00	$58.68
	12/01/2020	$35.20	$8.60	$15.77	$0.00	$59.57
	06/01/2021	$36.12	$8.60	$15.77	$0.00	$60.49
	12/01/2021	$37.03	$8.60	$15.77	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$49.33	$13.00	$15.70	$0.00	$78.03
	12/01/2020	$50.48	$13.00	$15.70	$0.00	$79.18
	06/01/2021	$51.58	$13.00	$15.70	$0.00	$80.28
	12/01/2021	$52.73	$13.00	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$49.33	$13.00	$15.70	$0.00	$78.03
	12/01/2020	$50.48	$13.00	$15.70	$0.00	$79.18
	06/01/2021	$51.58	$13.00	$15.70	$0.00	$80.28
	12/01/2021	$52.73	$13.00	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

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

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2020

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

Notes:

Apprentice to Journeyworker Ratio:1:4

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 02/01/2020

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

Effective Date - 08/01/2020

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

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$48.81	$13.00	$15.70	$0.00	$77.51
	12/01/2020	$49.95	$13.00	$15.70	$0.00	$78.65
	06/01/2021	$51.04	$13.00	$15.70	$0.00	$79.74
	12/01/2021	$52.18	$13.00	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2020	$40.30	$8.60	$17.24	$0.00	$66.14
	12/01/2020	$41.28	$8.60	$17.24	$0.00	$67.12
	06/01/2021	$42.30	$8.60	$17.24	$0.00	$68.14
	12/01/2021	$43.31	$8.60	$17.24	$0.00	$69.15
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2020	$39.15	$8.60	$17.24	$0.00	$64.99
	12/01/2020	$40.13	$8.60	$17.24	$0.00	$65.97
	06/01/2021	$41.15	$8.60	$17.24	$0.00	$66.99
	12/01/2021	$42.16	$8.60	$17.24	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2020	$39.15	$8.60	$17.24	$0.00	$64.99
	12/01/2020	$40.13	$8.60	$17.24	$0.00	$65.97
	06/01/2021	$41.15	$8.60	$17.24	$0.00	$66.99
	12/01/2021	$42.16	$8.60	$17.24	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	06/01/2020	$34.31	$8.60	$15.77	$0.00	$58.68
	12/01/2020	$35.20	$8.60	$15.77	$0.00	$59.57
	06/01/2021	$36.12	$8.60	$15.77	$0.00	$60.49
	12/01/2021	$37.03	$8.60	$15.77	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER"						

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

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2020

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

Effective Date - 09/01/2020

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

Notes:

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

Apprentice to Journeyworker Ratio:1:5

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

All Aspects of New Wood Frame Work

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Wood Frame) - Zone 2*

Effective Date - 10/01/2019

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

Notes:

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

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (LYNN)*	01/01/2020	$49.07	$12.75	$22.41	$0.62	$84.85

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (Lynn)*

Effective Date - 01/01/2020

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

Notes:

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

Apprentice to Journeyworker Ratio:1:3

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

For apprentice rates see "Apprentice- LABORER"

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

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

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

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2020

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

Effective Date - 01/01/2021

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

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 03/01/2020

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

Effective Date - 09/01/2020

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

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

Apprentice to Journeyworker Ratio:2:3***

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2020

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

Effective Date - 01/01/2021

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

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2020	$42.99	$15.73	$18.41	$0.00	$77.13
	01/01/2021	$44.43	$15.88	$19.31	$0.00	$79.62
	01/01/2022	$45.93	$16.03	$20.21	$0.00	$82.17
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 2*	06/01/2020	$34.31	$8.60	$15.77	$0.00	$58.68
	12/01/2020	$35.20	$8.60	$15.77	$0.00	$59.57
	06/01/2021	$36.12	$8.60	$15.77	$0.00	$60.49
	12/01/2021	$37.03	$8.60	$15.77	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2020	$44.73	$12.50	$15.70	$0.00	$72.93
	11/01/2020	$45.73	$12.50	$15.70	$0.00	$73.93
	05/01/2021	$46.88	$12.50	$15.70	$0.00	$75.08
	11/01/2021	$47.88	$12.50	$15.70	$0.00	$76.08
	05/01/2022	$49.03	$12.50	$15.70	$0.00	$77.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2020	$46.23	$12.50	$15.70	$0.00	$74.43
	11/01/2020	$47.24	$12.50	$15.70	$0.00	$75.44
	05/01/2021	$48.40	$12.50	$15.70	$0.00	$76.60
	11/01/2021	$49.41	$12.50	$15.70	$0.00	$77.61
	05/01/2022	$50.57	$12.50	$15.70	$0.00	$78.77
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 03/01/2020

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

Effective Date - 09/01/2020

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

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

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$49.33	$13.00	$15.70	$0.00	$78.03
	12/01/2020	$50.48	$13.00	$15.70	$0.00	$79.18
	06/01/2021	$51.58	$13.00	$15.70	$0.00	$80.28
	12/01/2021	$52.73	$13.00	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$32.72	$13.00	$15.70	$0.00	$61.42
	12/01/2020	$33.50	$13.00	$15.70	$0.00	$62.20
	06/01/2021	$34.25	$13.00	$15.70	$0.00	$62.95
	12/01/2021	$35.04	$13.00	$15.70	$0.00	$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	07/01/2020	$41.01	$8.25	$22.40	$0.00	$71.66
	01/01/2021	$41.56	$8.25	$22.75	$0.00	$72.56

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 07/01/2020

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

Effective Date - 01/01/2021

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

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 06/01/2020

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

Effective Date - 12/01/2020

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

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2020	$49.36	$13.35	$24.12	$2.61	$89.44
	08/01/2020	$50.96	$13.35	$24.12	$2.66	$91.09
	02/01/2021	$52.61	$13.35	$24.12	$2.71	$92.79
	08/01/2021	$54.36	$13.35	$24.12	$2.76	$94.59
	02/01/2022	$56.11	$13.35	$24.12	$2.81	$96.39
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	03/01/2020	$53.50	$13.00	$19.20	$0.00	$85.70
	09/01/2020	$54.93	$13.00	$19.25	$0.00	$87.18
	03/01/2021	$56.13	$13.00	$19.28	$0.00	$88.41
	09/01/2021	$57.56	$13.00	$19.33	$0.00	$89.89
	03/01/2022	$58.76	$13.00	$19.36	$0.00	$91.12
	09/01/2022	$60.19	$13.00	$19.41	$0.00	$92.60
	03/01/2023	$61.39	$13.00	$19.44	$0.00	$93.83
For apprentice rates see "Apprentice- ELECTRICIAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2020	$49.36	$13.35	$24.12	$2.61	$89.44
	08/01/2020	$50.96	$13.35	$24.12	$2.66	$91.09
	02/01/2021	$52.61	$13.35	$24.12	$2.71	$92.79
	08/01/2021	$54.36	$13.35	$24.12	$2.76	$94.59
	02/01/2022	$56.11	$13.35	$24.12	$2.81	$96.39
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537 (Local 138)*	03/01/2020	$51.86	$10.95	$19.74	$0.00	$82.55
	09/01/2020	$53.36	$10.95	$19.74	$0.00	$84.05
	03/01/2021	$54.86	$10.95	$19.74	$0.00	$85.55
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537 (Local 138)*	03/01/2020	$51.86	$10.95	$19.74	$0.00	$82.55
	09/01/2020	$53.36	$10.95	$19.74	$0.00	$84.05
	03/01/2021	$54.86	$10.95	$19.74	$0.00	$85.55
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 2*	06/01/2020	$34.81	$8.60	$15.77	$0.00	$59.18
	12/01/2020	$35.70	$8.60	$15.77	$0.00	$60.07
	06/01/2021	$36.62	$8.60	$15.77	$0.00	$60.99
	12/01/2021	$37.53	$8.60	$15.77	$0.00	$61.90
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2019	$48.44	$12.80	$16.40	$0.00	$77.64

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

Effective Date - 09/01/2019

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

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (LAWRENCE AREA)*	03/16/2019	$42.25	$8.00	$23.50	$0.00	$73.75

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 7 Lawrence*

Effective Date - 03/16/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.35	$8.00	$23.50	$0.00	$56.85
2	70	$29.58	$8.00	$23.50	$0.00	$61.08
3	75	$31.69	$8.00	$23.35	$0.00	$63.04
4	80	$33.80	$8.00	$23.50	$0.00	$65.30
5	85	$35.91	$8.00	$23.50	$0.00	$67.41
6	90	$38.03	$8.00	$23.50	$0.00	$69.53

Notes:

Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	06/01/2020	$34.31	$8.60	$15.77	$0.00	$58.68
	12/01/2020	$35.20	$8.60	$15.77	$0.00	$59.57
	06/01/2021	$36.12	$8.60	$15.77	$0.00	$60.49
	12/01/2021	$37.03	$8.60	$15.77	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 2*	06/01/2020	$34.06	$8.60	$15.77	$0.00	$58.43
	12/01/2020	$34.95	$8.60	$15.77	$0.00	$59.32
	06/01/2021	$35.87	$8.60	$15.77	$0.00	$60.24
	12/01/2021	$36.78	$8.60	$15.77	$0.00	$61.15

Apprentice - *LABORER - Zone 2*

Effective Date - 06/01/2020

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

Effective Date - 12/01/2020

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

Notes:

Apprentice to Journeyworker Ratio:1:5

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 02/01/2020

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

Effective Date - 08/01/2020

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

Notes:

Apprentice to Journeyworker Ratio:1:3

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 02/01/2020

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

Effective Date - 08/01/2020

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

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$48.81	$13.00	$15.70	$0.00	$77.51
	12/01/2020	$49.95	$13.00	$15.70	$0.00	$78.65
	06/01/2021	$51.04	$13.00	$15.70	$0.00	$79.74
	12/01/2021	$52.18	$13.00	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$48.81	$13.00	$15.70	$0.00	$77.51
	12/01/2020	$49.95	$13.00	$15.70	$0.00	$78.65
	06/01/2021	$51.04	$13.00	$15.70	$0.00	$79.74
	12/01/2021	$52.18	$13.00	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2) *MILLWRIGHTS LOCAL 1121 - Zone 2*	04/01/2019	$38.87	$9.90	$18.50	$0.00	$67.27

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 2*

Effective Date - 04/01/2019

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$21.38	$9.90	$5.31	$0.00	$36.59
2	65	$25.27	$9.90	$15.13	$0.00	$50.30
3	75	$29.15	$9.90	$16.10	$0.00	$55.15
4	85	$33.04	$9.90	$17.06	$0.00	$60.00

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 2*	06/01/2020	$34.31	$8.60	$15.77	$0.00	$58.68
	12/01/2020	$35.20	$8.60	$15.77	$0.00	$59.57
	06/01/2021	$36.12	$8.60	$15.77	$0.00	$60.49
	12/01/2021	$37.03	$8.60	$15.77	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$23.13	$13.00	$15.70	$0.00	$51.83
	12/01/2020	$23.70	$13.00	$15.70	$0.00	$52.40
	06/01/2021	$24.25	$13.00	$15.70	$0.00	$52.95
	12/01/2021	$24.83	$13.00	$15.70	$0.00	$53.53
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$27.79	$13.00	$15.70	$0.00	$56.49
	12/01/2020	$28.47	$13.00	$15.70	$0.00	$57.17
	06/01/2021	$29.11	$13.00	$15.70	$0.00	$57.81
	12/01/2021	$29.79	$13.00	$15.70	$0.00	$58.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$48.81	$13.00	$15.70	$0.00	$77.51
	12/01/2020	$49.95	$13.00	$15.70	$0.00	$78.65
	06/01/2021	$51.04	$13.00	$15.70	$0.00	$79.74
	12/01/2021	$52.18	$13.00	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2020	$51.51	$8.25	$22.40	$0.00	$82.16
	01/01/2021	$52.06	$8.25	$22.75	$0.00	$83.06

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2020

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

Effective Date - 01/01/2021

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

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 07/01/2020

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

Effective Date - 01/01/2021

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

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 07/01/2020

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

Effective Date - 01/01/2021

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

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 2*	06/01/2020	$34.06	$8.60	$15.77	$0.00	$58.43
	12/01/2020	$34.95	$8.60	$15.77	$0.00	$59.32
	06/01/2021	$35.87	$8.60	$15.77	$0.00	$60.24
	12/01/2021	$36.78	$8.60	$15.77	$0.00	$61.15
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2020	$41.01	$8.25	$22.40	$0.00	$71.66
	01/01/2021	$41.56	$8.25	$22.75	$0.00	$72.56

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 07/01/2020

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

Effective Date - 01/01/2021

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

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 07/01/2020

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

Effective Date - 01/01/2021

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

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2019

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

Notes:

Apprentice to Journeyworker Ratio:1:5

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

Apprentice - *PIPEFITTER Local 537 (Local 138)*

Effective Date - 03/01/2020

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

Effective Date - 09/01/2020

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

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.

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

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER *LABORERS - ZONE 2*	06/01/2020	$34.31	$8.60	$15.77	$0.00	$58.68
	12/01/2020	$35.20	$8.60	$15.77	$0.00	$59.57
	06/01/2021	$36.12	$8.60	$15.77	$0.00	$60.49
	12/01/2021	$37.03	$8.60	$15.77	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER"						
PLUMBER *PLUMBERS & GASFITTERS LOCAL 12 (Local 138)*	03/01/2020	$54.61	$12.07	$17.26	$0.00	$83.94
	09/01/2020	$56.11	$12.07	$17.26	$0.00	$85.44
	03/01/2021	$57.61	$12.07	$17.26	$0.00	$86.94

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

Effective Date - 03/01/2020

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

Effective Date - 09/01/2020

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

Notes:

Steps are 1 yr

Step 4 with lic$62.47, Step5 with lic$69.63

Apprentice to Journeyworker Ratio:1:5

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537 (Local 138)*	03/01/2020	$51.86	$10.95	$19.74	$0.00	$82.55
	09/01/2020	$53.36	$10.95	$19.74	$0.00	$84.05
	03/01/2021	$54.86	$10.95	$19.74	$0.00	$85.55
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	06/01/2020	$34.31	$8.60	$15.77	$0.00	$58.68
	12/01/2020	$35.20	$8.60	$15.77	$0.00	$59.57
	06/01/2021	$36.12	$8.60	$15.77	$0.00	$60.49
	12/01/2021	$37.03	$8.60	$15.77	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 2*	06/01/2020	$35.06	$8.60	$15.77	$0.00	$59.43
	12/01/2020	$35.95	$8.60	$15.77	$0.00	$60.32
	06/01/2021	$36.87	$8.60	$15.77	$0.00	$61.24
	12/01/2021	$37.78	$8.60	$15.77	$0.00	$62.15
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$49.33	$13.00	$15.70	$0.00	$78.03
	12/01/2020	$50.48	$13.00	$15.70	$0.00	$79.18
	06/01/2021	$51.58	$13.00	$15.70	$0.00	$80.28
	12/01/2021	$52.73	$13.00	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$49.33	$13.00	$15.70	$0.00	$78.03
	12/01/2020	$50.48	$13.00	$15.70	$0.00	$79.18
	06/01/2021	$51.58	$13.00	$15.70	$0.00	$80.28
	12/01/2021	$52.73	$13.00	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$32.72	$13.00	$15.70	$0.00	$61.42
	12/01/2020	$33.50	$13.00	$15.70	$0.00	$62.20
	06/01/2021	$34.25	$13.00	$15.70	$0.00	$62.95
	12/01/2021	$35.04	$13.00	$15.70	$0.00	$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS 170 - J.G. MacLellan (Lowell)*	05/01/2020	$25.15	$9.65	$6.35	$0.00	$41.15
	01/01/2021	$25.15	$10.01	$6.35	$0.00	$41.51
	05/01/2021	$25.50	$10.01	$6.35	$0.00	$41.86
	01/01/2022	$25.50	$10.37	$6.35	$0.00	$42.22
	05/01/2022	$25.85	$10.37	$6.35	$0.00	$42.57
	01/01/2023	$25.85	$10.77	$6.35	$0.00	$42.97
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$48.81	$13.00	$15.70	$0.00	$77.51
	12/01/2020	$49.95	$13.00	$15.70	$0.00	$78.65
	06/01/2021	$51.04	$13.00	$15.70	$0.00	$79.74
	12/01/2021	$52.18	$13.00	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 2*	06/01/2020	$34.31	$8.60	$15.77	$0.00	$58.68
	12/01/2020	$35.20	$8.60	$15.77	$0.00	$59.57
	06/01/2021	$36.12	$8.60	$15.77	$0.00	$60.49
	12/01/2021	$37.03	$8.60	$15.77	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$48.81	$13.00	$15.70	$0.00	$77.51
	12/01/2020	$49.95	$13.00	$15.70	$0.00	$78.65
	06/01/2021	$51.04	$13.00	$15.70	$0.00	$79.74
	12/01/2021	$52.18	$13.00	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	03/01/2020	$45.67	$11.50	$15.90	$0.00	$73.07
	08/01/2020	$47.10	$11.50	$15.90	$0.00	$74.50
	02/01/2021	$48.53	$11.50	$15.90	$0.00	$75.93
	08/01/2021	$49.96	$11.50	$15.90	$0.00	$77.36
	02/01/2022	$51.39	$11.50	$15.90	$0.00	$78.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 03/01/2020

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

Effective Date - 08/01/2020

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

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

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	03/01/2020	$45.92	$11.50	$15.90	$0.00	$73.32
	08/01/2020	$47.35	$11.50	$15.90	$0.00	$74.75
	02/01/2021	$48.78	$11.50	$15.90	$0.00	$76.18
	08/01/2021	$50.21	$11.50	$15.90	$0.00	$77.61
	02/01/2022	$51.64	$11.50	$15.90	$0.00	$79.04
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2020	$49.36	$13.35	$24.12	$2.61	$89.44
	08/01/2020	$50.96	$13.35	$24.12	$2.66	$91.09
	02/01/2021	$52.61	$13.35	$24.12	$2.71	$92.79
	08/01/2021	$54.36	$13.35	$24.12	$2.76	$94.59
	02/01/2022	$56.11	$13.35	$24.12	$2.81	$96.39

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 02/01/2020

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

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$21.40	$13.35	$5.89	$0.00	$40.64
2	42	$21.40	$13.35	$5.89	$0.00	$40.64
3	47	$23.95	$13.35	$11.13	$1.45	$49.88
4	47	$23.95	$13.35	$11.13	$1.45	$49.88
5	52	$26.50	$13.35	$12.08	$1.56	$53.49
6	52	$26.50	$13.35	$12.33	$1.57	$53.75
7	60	$30.58	$13.35	$13.70	$1.73	$59.36
8	65	$33.12	$13.35	$15.15	$1.85	$63.47
9	75	$38.22	$13.35	$16.56	$2.04	$70.17
10	85	$43.32	$13.35	$17.96	$2.24	$76.87

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

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

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

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

Effective Date - 03/01/2020

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

Effective Date - 10/01/2020

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

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

Apprentice to Journeyworker Ratio:1:3

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

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

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

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

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

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 03/01/2020

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

Effective Date - 09/01/2020

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

Notes:

Apprentice to Journeyworker Ratio:1:1

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2020

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

Effective Date - 08/01/2020

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

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	06/01/2020	$40.55	$8.60	$17.24	$0.00	$66.39
	12/01/2020	$41.53	$8.60	$17.24	$0.00	$67.37
	06/01/2021	$42.55	$8.60	$17.24	$0.00	$68.39
	12/01/2021	$43.56	$8.60	$17.24	$0.00	$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	06/01/2020	$39.27	$8.60	$17.24	$0.00	$65.11
	12/01/2020	$40.25	$8.60	$17.24	$0.00	$66.09
	06/01/2021	$41.27	$8.60	$17.24	$0.00	$67.11
	12/01/2021	$42.28	$8.60	$17.24	$0.00	$68.12
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2020	$39.15	$8.60	$17.24	$0.00	$64.99
	12/01/2020	$40.13	$8.60	$17.24	$0.00	$65.97
	06/01/2021	$41.15	$8.60	$17.24	$0.00	$66.99
	12/01/2021	$42.16	$8.60	$17.24	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	06/01/2020	$48.81	$13.00	$15.70	$0.00	$77.51
	12/01/2020	$49.95	$13.00	$15.70	$0.00	$78.65
	06/01/2021	$51.04	$13.00	$15.70	$0.00	$79.74
	12/01/2021	$52.18	$13.00	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

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

Outside Electrical - East

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 09/01/2019

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

Effective Date - 08/30/2020

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

Notes:

Apprentice to Journeyworker Ratio:1:2

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

Additional Apprentice Information:

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

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

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

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

SECTION 00 0110
TABLE OF CONTENTS

PART A – BIDDING DOCUMENTS, CONTRACT FORMS, CONDITIONS OF THE CONTRACT
Refer to earlier “Table of Contents”.

PART B - TECHNICAL SPECIFICATIONS

*Filed Sub-Bid Required

END OF TOC

*Filed Sub-Bid Required

DOCUMENT 00 0107
DESIGN TEAM

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect:
1. Gienapp Architects, LLC.
2. 20 Conant Street, Danvers, MA 01923
3. Tel: (978) 750-9062

B. Civil Engineer:
1. Hancock Associates
2. 185 Centre Street, Danvers, MA 01923
3. Tel: (978) 777-3050

C. Fire-Protection, Plumbing, and Mechanical Engineer:
1. Northeast Engineering & Commissioning
2. 136 Coleman Road, Auburn, NH 03032
3. Tel: (978) 430-0565

D. Electrical Engineer:
1. BLW Engineers
2. 311 Great Road, Littleton, MA 01460
3. Tel: (978) 486-4301

END OF DOCUMENT

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SECTION 00 0115
LIST OF DRAWINGS

GENERAL PROJECT INFORMATION
G001 Title Sheet
G002 Legends, Notes, and Abbreviations

SITE INFORMATION
C101 Site Plan
C101-A Architectural Site Plan – Site Drainage

DEMOLITION
AD111 First Floor Demolition Plan
AD121 Second Floor Demolition Plan
AD122 Second Floor Ceiling Demolition Plan

ARCHITECTURAL
A111 First Floor Plan
A121 Second Floor Plan
A131 Attic Floor Plan
A141 Roof Plan & Details
A151 First Floor Reflected Ceiling Plan
A152 Second Floor Reflected Ceiling Plan
A201 North and South Elevation
A202 East and West Elevation
A300 Exterior Building Details
A501 Interior Elevations and Enlarged Plans
A502 Interior Elevations and Millwork
A601 Partition, Door and Window Schedule

FIRE PROTECTION
FP-1 Fire Protection New Work Plan

PLUMBING
P-1 Plumbing New Work Plans

MECHANICAL
HD-1 HVAC First Floor Demolition Plan
HD-2 HVAC 2nd Floor Demolition Plan
HD-3 HVAC Attic Ductwork Demolition Plan
HD-4 HVAC Attic Piping Demolition Plan
H-0 HVAC Schedules
H-1 HVAC First Floor New Work Plan
H-2 HVAC 2nd Floor New Work Plan
H-3 HVAC Attic Ductwork New Work Plan

ELECTRICAL
E0-1 Electrical Legend
E0-2 Electrical Schedules and Power Riser
ED1-0 Electrical Demolition
ED2-0 Electrical 1st Floor Demolition
E-1 Electrical New Work 1st Floor
E-2 Electrical New Work 2nd Floor
E-3 Electrical New Work Attic
E-4 Electrical New Work Part Plans

END OF SECTION

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SECTION 01 1000
SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Times for Completion and Liquidated Damages.
   4. Work performed by Owner.
   5. Contractor's use of site and premises.
   6. Coordination with occupants.
   7. Work restrictions.
   8. Specification and Drawing conventions.
   9. Permit fees.
   10. Miscellaneous provisions.

B. Related Requirements:
   1. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
   2. Section 01 7300 "Execution" for coordination of Owner-installed products.

1.3 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

A. Project Identification: Boxford Town Hall HVAC, Exterior Repairs, Library Renovation.
   1. Project Location: 7 Spofford Road, Boxford, Massachusetts.

B. Owner: Town of Boxford, 7 Spofford Road, Boxford, MA

C. Architect: Gienapp Architects, LLC, 20 Conant Street, Danvers, MA

1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. This summary of work is intended to provide a clearer understanding of the work. It is not intended to be all inclusive. Bidders shall visit the site and make their own assessment of the information provided herein.

B. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
   1. HVAC improvements.
   2. Exterior repairs including, but not limited to, masonry, flashing, and roofing.
   3. Library renovation work including, but not limited to ceilings, flooring, and partition changes.
   4. Other Work indicated in the Contract Documents.

C. Type of Contract: Project will be constructed under a single prime contract.

1.6 TIMES FOR COMPLETION AND LIQUIDATED DAMAGES

A. It is hereby understood and mutually agreed, by and between the General Contractor and the Owner, that the date of beginning and the times for completion, as specified in the Contract for the work to be done hereunder are ESSENTIAL CONDITIONS of this Contract, and it is further

mutually understood and agreed that the work embraced in this Contract shall be commenced by the date specified therein.

B. The Work shall commence at the time stated in the Notice to Proceed and shall be substantially completed as stated in the Contract and is anticipated as follows unless specifically noted otherwise in the General Conditions of the Contract.
   1. Total contract time: 260 calendar days.
   2. Total on-site construction time: 150 calendar days.

C. The General Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will ensure full completion thereof within the time specified. It is expressly understood and agreed, by and between the General Contractor and the Owner, that the time for completion of the work described herein are adequate but of limited duration for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality. The General Contractor and all Subcontractors shall be responsible for executing the Work in a manner to meet all requirements of the Contract and completing the Work on time.

D. If the General Contractor should neglect, fail, or refuse to Substantially Complete the work within the times specified in the Contract, or any proper extension thereof, granted by the Owner, then the General Contractor does hereby agree, as part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the Contract, not as a penalty, but as liquidated damages for such breach of Contract as hereinafter set forth, for each and every calendar day that the General Contractor shall be in default after the time stipulated in the Contract for completion of the work. **The Liquidated Damages shall be $1,000 (One Thousand Dollars) per calendar day.**

E. The said amounts are fixed and agreed upon by and between the General Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be in the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

F. It is further agreed that time is of the essence of each and every portion of the Contract and of the CONTRACT DOCUMENTS wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit is fixed by such extension shall be of the essence for this Contract. Provided, that the General Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:
   1. To any preference, priority, or allocation order duly issued by the Government;
   2. To unforeseeable causes beyond the control and without fault or negligence of the General Contractor, including but not restricted to, Acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics,, quarantine restrictions, strikes, freight embargoes, and unusual weather; and
   3. To any delay of Subcontractors or suppliers occasioned by any of the causes specified in subparagraphs 1. and 2. of this Paragraph. Provided, further, that the General Contractor shall, within ten days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the Contract, notify the Owner, in writing, of the causes of the delay and to notify the General Contractor within a reasonable time of its decision in the matter.

G. The total damages due at project closeout will be based upon the overall project duration to Substantial Completion. However, in the event the Contractor shall fail to accomplish Substantial Completion of any Phase of the project, liquidated damages shall be withheld commencing with the scheduled date of Substantial Completion of that Phase, and be retained through Substantial Completion of the project. This will be progress withholdings, parallel to progress payments. Damages for a specific phase will not be withheld if the Substantial Completion of the entire project is completed in accordance with the schedule set forth herein.

H. Each and every provision of the laws and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is

not correctly inserted, then upon application of either party the Contract shall forthwith be physically amended to make such insertion or correction.

1.7 WORK PERFORMED BY OWNER

A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before Work under this Contract begins.

1. Relocation of the Town Offices.
    a. Limited furniture relocation on the second floor to provide access to walls where windows are being removed and replaced, and to ceilings at eave locations.
    b. Limited furniture relocation on the second floor to provide access to approximate HVAC equipment location. This is limited to the location of the ceiling mounted HVAC equipment. This will be performed based on the approximate locations shown on the Contract Documents, and may differ from those locations developed in the shop drawings.
    c. It is not the intent to remove furniture on the second floor. Rather, it will be moved relatively "out of the way" so the Contractor may perform the work of this project.
    d. If additional relocation of furniture is required, it shall the responsibility of the Contractor to do so, which shall include returning furniture to its original position.
    e. The Contractor shall provide temporary protection as described in Section 01 5000 Temporary Facilities and Controls to ensure furniture is not damaged during Construction.
2. Relocation of the Library.
    a. Furniture relocation on the first floor in the library areas. It is anticipated that some furniture will be stored in rooms that have limited to no work such as the first floor Meeting Room. Furniture against remaining partitions may not be relocated.
    b. In library areas on the first floor, it is the intent to remove furniture so the Contractor may perform the work of this project. Some furniture will remain on-site in areas with limited or no work.
    c. The Contractor shall provide temporary protection as described in Section 01 5000 Temporary Facilities and Controls to ensure furniture is not damaged during Construction.

C. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract.

1. Relocation of furniture that was moved preceding the work of this Contract.

1.8 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1. Once per day, at a time mutually agreeable to the Contractor, the Owner may have personnel enter the work area to access files and other items that are remaining in the second-floor offices. The Contractor shall provide access to these areas during this time.

B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.9 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
1. Weekend Hours: Saturday 7:00 a.m. to 4:00 p.m., Sunday not permitted.
2. Hours for Utility Shutdowns: Same as on-site work hours.
3. Hours for Core Drilling and other 'noisy' activities: 9:00 a.m. to 12:00 p.m.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
1. Notify Owner not less than seven days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.

1.12 PERMIT FEES

A. Permit fees paid to the Town of Boxford are waived. Other permit fees are still applicable.

1.13 MISCELLANEOUS PROVISIONS

A. None.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 2300
ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
B. Execute accepted alternates under the same conditions as other work of the Contract.
C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: N/A.

END OF SECTION

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SECTION 01 2600
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 01 1100 "Summary of Work" for administrative procedures.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 2900
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 01 2600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
   a. Project name and location.
   b. Owner's name.
   c. Owner's Project number.
   d. Name of Architect.
   e. Architect's Project number.
   f. Contractor's name and address.
   g. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
   a. Related Specification Section or division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
      1) Labor.
      2) Materials.
      3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site.
6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
8. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
9. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
B. Payment Application Times: Submit Application for Payment to Architect by the last of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
    1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
    1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.
D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
    1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
    2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
    3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
    1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
    2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
    3. Provide summary documentation for stored materials indicating the following:
        a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.

b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
2. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Schedule of unit prices.
5. Copies of building permits.
6. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
7. Certificates of insurance and insurance policies.
8. Performance and payment bonds.
9. Data needed to acquire Owner's insurance.

H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 01 7700 "Closeout Procedures."
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706.
6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 3100
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
   1. General coordination procedures.
   2. RFIs.
   3. Digital project management procedures.
   4. Project meetings.

B. Related Requirements:
   1. Section 01 3200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 01 7300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Section 01 7700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request for Information. Request from Owner, Architect, OPM, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Before start of on site construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of 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.
   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 to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. 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.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.
   8. Startup, testing and commissioning of systems.

1.6 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Architect and OPM will return without response those RFIs submitted to Architect and OPM by other entities controlled by Contractor.
   2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Owner name.
   3. Name of Architect.
   4. Name of OPM.
   5. Date.
   6. Name of Contractor.
   7. RFI number, numbered sequentially.
   8. RFI subject.
   9. Specification Section number and title and related paragraphs, as appropriate.
   10. Drawing number and detail references, as appropriate.
   11. Field dimensions and conditions, as appropriate.
   12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to Architect and OPM.
   1. Attachments shall be electronic files in PDF format.

D. Architect’s Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI.
   1. Architect’s action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
   2. Architect’s action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 2600 "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. Name and address of OPM.
   5. RFI number, including RFIs that were returned without action or withdrawn.
   6. RFI description.
   7. Date the RFI was submitted.
   8. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and OPM within seven days if Contractor disagrees with response.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct weekly project meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct preconstruction conference before starting construction, at a time convenient to Owner, Architect and OPM, but no later than 30 days after execution of the Agreement.
   1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. 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 could affect progress, including the following:
      a. Responsibilities and personnel assignments.
      b. Tentative construction schedule.
      c. Phasing.
      d. Critical work sequencing and long lead items.
      e. Designation of key personnel and their duties.
      f. Lines of communications.
      g. Procedures for processing field decisions and Change Orders.
      h. Procedures for RFIs.
      i. Procedures for testing and inspecting.
      j. Procedures for processing Applications for Payment.
      k. Distribution of the Contract Documents.
      l. Submittal procedures.
      m. Preparation of Record Documents.
      n. Use of the premises and existing building.
      o. Work restrictions.
      p. Working hours.
      q. Owner's occupancy requirements.
      r. Responsibility for temporary facilities and controls.
      s. Procedures for disruptions and shutdowns.
      t. Parking availability.
      u. Office, work, and storage areas.
      v. Equipment deliveries and priorities.
      w. First aid.
      x. Security.

y. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
4. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
5. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and OPM of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference as part of a regular construction meeting not later than 15 days prior to the scheduled date of Substantial Completion.

E. Progress Meetings: Conduct progress meetings at weekly intervals, or as needed when milestones occur. This can be determined at the Preinstallation Conference.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Architect, and OPM, 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 meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since 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.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
    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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 3200
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Startup construction schedule.
   2. Contractor's Construction Schedule.
   3. Construction schedule updating report including weekly generated, three-week focused look-ahead schedules.
   4. Daily construction reports.
   5. Material location reports.
   6. Site condition reports.
   7. Unusual event reports.

B. Related Requirements:
   1. Section 01 4000 "Quality Requirements" for schedule of tests and inspections.
   2. Section 01 2900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project.

B. Event: The starting or ending point of an activity.

C. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Working electronic copy of schedule file.
   2. PDF file.
   3. One paper copy of sufficient size to display entire period or schedule, as required.

B. Startup construction schedule.
   1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Submit at weekly intervals.

F. Weekly generated look-ahead schedules. For each weekly project construction meeting provide a focused schedule of the next three weeks. Identify where activities do not complete within the time-frame allowed in the overall project schedule.

G. Unusual Event Reports: Submit at time of unusual event.

H. Qualification Data: For scheduling consultant.

1.5 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each building and separate area as a separate numbered activity for each main element of the Work. Collect all work by Phase. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
   4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
   5. Commissioning Time: Indicate time for each Performance Testing and Acceptance Testing as required by Section 02 0800 Security Testing and Commissioning.
   6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
   8. Indicate substantial completion date of each phase.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Limitations of continued occupancies.
      c. Uninterruptible services.
      d. Use-of-premises restrictions.
   2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
      a. Manufacturer.
      b. Deliveries.
      c. Installation.
      d. Tests and inspections.
      e. Testing and Commissioning.
      f. Startup and placement into final use and operation.
   3. Construction Areas: Identify each building within each Phase of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
      a. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion of each phase, and Final Completion**.**

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update.

F. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate Final Completion percentage for each activity.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work.

1.8 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for Notice to Proceed.
   1. Base schedule on the startup construction schedule and additional information received since the start of Project.

1.9 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of separate contractors at Project site.
   2. Approximate count of personnel at each Project site.
   3. Equipment at Project site.
   4. Material deliveries.
   5. Testing and inspection.
   6. Accidents.
   7. Meetings and significant decisions.
   8. Unusual events.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. Revise "Site Condition Reports" Paragraph below to suit Project and special Owner requirements.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 3300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Submittal schedule requirements.
   2. Administrative and procedural requirements for submittals.

B. Related Requirements:
   1. Section 01 2900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Section 01 3100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
   3. Section 01 3200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   4. Section 01 4000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
   5. Section 01 7700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
   6. Section 01 7823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   7. Section 01 7839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   8. Section 01 7900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:
   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal Category: Action; informational.
   d. Name of subcontractor.
   e. Description of the Work covered.
   f. Scheduled date for Architect's final release or approval.
   g. Scheduled dates for purchasing.
   h. Scheduled date of fabrication.
   i. Scheduled dates for installation.
   j. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:
   1. Project name.
   2. Date.
   3. Name of Architect.
   4. Name of Construction Manager.
   5. Name of Contractor.
   6. Name of firm or entity that prepared submittal.
   7. Names of subcontractor, manufacturer, and supplier.
   8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
   9. Category and type of submittal.
   10. Submittal purpose and description.
   11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
   12. Drawing number and detail references, as appropriate.
   13. Indication of full or partial submittal.
   14. Location(s) where product is to be installed, as appropriate.
   15. Other necessary identification.
   16. Remarks.
   17. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email or other method established at the Preconstruction Meeting. Include PDF transmittal form. Include information in email subject line as requested by Architect.
      a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
4. Resubmittals shall include all items from the original submittal package, even if other items have been approved.

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

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams that show factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.
2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.
a. Two opaque (bond) copies of each submittal. Architect will return one copy(ies).

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.
3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
4. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing

color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
   1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
   2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:
   1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
   2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
   3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
   4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
   5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
   6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:
   1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
   2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
   3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
    1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
    1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
    1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
    1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
    2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
E. Architect will return without review or discard submittals received from sources other than Contractor.
F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

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

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."

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

E. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 CONFLICTING REQUIREMENTS

A. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

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

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 30 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections.

1.8 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

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

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

E. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.9 QUALITY CONTROL

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

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

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

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

E. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

F. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
   4. Delivery of samples to testing agencies.
   5. Security and protection for samples and for testing and inspection equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect and OPM.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.
   1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
B. Protect construction exposed by or for quality-control service activities.
C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 4200
REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.
B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "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": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
H. "Provide": Furnish and install, complete and ready for the intended use.
I. "Project Site": Space available for performing construction activities. 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.
    1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
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.

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's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 01 1000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Waste-handling procedures.
4. Other dust-control measures.

1.4 QUALITY ASSURANCE

A. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines .

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete bases for supporting posts.

B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

C. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
3. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
4. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 7700 "Closeout Procedures."

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Section 01 1000 "Summary."
B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
B. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
C. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
   1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:
   1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
   2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.
C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
D. Storage and Staging: Use designated areas of Project site for storage and staging needs.
E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.
F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
   1. Identification Signs: Provide Project identification signs as indicated on Drawings.
   2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   3. Maintain and touch up signs, so they are legible at all times.
G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 7300 "Execution."
H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
I. Temporary Elevator Use: Use of elevators is not permitted .

J. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Section 01 1000 "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
   1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
   2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
   3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
   4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: Before construction operations begin , furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations .
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
   1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 "Closeout Procedures."

3.8 COVID-19 PROCEDURES

A. The Contractor shall follow current state and local COVID-19 construction guidelines.

END OF SECTION

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SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 01 1000 "Summary" for Contractor requirements related to Owner-furnished products.
2. Section 01 2300 "Alternates" for products selected under an alternate.
3. Section 01 4200 "References" for applicable industry standards for products specified.
4. Section 01770 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
   1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
   2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 3300 "Submittal Procedures."

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
   1. Resolution of Compatibility Disputes between Multiple Contractors:
      a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
      b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
   1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
   2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
      a. Name of product and manufacturer.
      b. Model and serial number.
      c. Capacity.
      d. Speed.
      e. Ratings.
   3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:
1. Provide a secure location and enclosure at Project site for storage of materials and equipment. There is not a location in the Owner's buildings for storage of materials for this contract. If materials will be delivered in advance of daily work, arrange for a storage trailer and place in a location approved by the Director of Facilities.
2. Store products to allow for inspection and measurement of quantity or counting of units.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

B. Submittal Time: Comply with requirements in Section 01 7700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
a. Submit additional documentation required by in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.

3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 3300 "Submittal Procedures."
1. Form of Approval of Submittal: As specified in Section 01 3300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

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SECTION 01 7300
EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
   1. Installation of the Work.
   2. Cutting and patching.
   3. Coordination of Owner's portion of the Work.
   4. Coordination of Owner-installed products.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.

B. Related Requirements:
   1. Section 01 7700 "Closeout Procedures" for submitting Project Record Documents, recording of Owner-accepted deviations, replacing defective work, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
   2. Cutting and patching less than 6 inches in diameter or length shall be done by the trade requiring it. Otherwise, it should be the responsibility of the General Contractor.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Examine roughing-in for electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings.

3.4 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb, and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal wiring in finished areas unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings. Do not install lower than ceiling heights without Architects Approval.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

E. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

F. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

G. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

H. Repair or remove and replace damaged, defective, or nonconforming Work.
1. Comply with Section 01 7700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.5 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
4. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
b. Restore damaged pipe covering to its original condition.
3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

3.6 PROGRESS CLEANING

A. Clean Project site and work areas daily, more often where work area is occupied, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

B. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

C. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

D. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

E. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

F. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

B. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Manufacturer's Field Service: Comply with qualification requirements in Section 01 4000 "Quality Requirements."

3.8 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

END OF SECTION

SECTION 01 7700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.

B. Related Requirements:
   1. Section 01 2900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
   2. Section 01 7823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
   3. Section 01 7839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.3 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.
B. Certificate of Insurance: For continuing coverage.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities.
   2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.

3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
   a. Schedule of Maintenance Material Items: Prepare and submit Attic Stock as required by the individual sections. Obtain OPM's and Facilities Department signature for receipt of submittals.
5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
5. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
7. Complete final cleaning requirements.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment, other than retainage, in accordance with Section 01 2900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by the Contractor stating that each item has been completed or otherwise resolved for acceptance.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and OPM will either proceed with inspection or notify Contractor of unfulfilled requirements.

1.9 LIST OF INCOMPLETE ITEMS (PUNCHLIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Create separate list for each building.
2. Organize list of spaces by building.

3. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
4. Include the following information at the top of each page:
    a. Project name.
    b. Date.
    c. Name of Architect and OPM
    d. Name of Contractor.
    e. Page number.

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
E. Warranties in Paper Form:
    1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inchpaper.
    2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
    3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
B. Cleaning: Comply with manufacturer's written instructions.
    1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
        a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
        b. Remove tools, construction equipment, machinery, and surplus material from Project site.
        c. Remove labels that are not permanent.
        d. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 01 7300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION

SECTION 01 7823
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory manuals.
   2. Emergency manuals.
   3. Systems and equipment operation manuals.
   4. Systems and equipment maintenance manuals.
   5. Product maintenance manuals.

B. Related Requirements:
   1. Section 01 3300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit Initial operation and maintenance manuals in electronic pdf format and enable reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least **30** days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

E. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inchpaper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary, to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inchwhite bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.5 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
D. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   4. Material and chemical composition.
   5. Reordering information for specially manufactured products.
E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Repair instructions.
F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 7839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
   1. Record Drawings.
   2. Record specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Section 01 7300 "Execution" for final property survey.
   2. Section 01 7700 "Closeout Procedures" for general closeout procedures.
   3. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of Record Drawings as follows:
      a. Initial Submittal:
         1) Submit PDF electronic files of scanned record prints and one set of file prints.
         2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit two paper-copies set of marked-up record prints. One copy is allowed to be a colored scanned and printed color copy of the original.
         2) Submit PDF electronic files of scanned Record Prints and one set of file prints.
         3) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit **annotated PDF electronic files** of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit **annotated PDF electronic files and directories** of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit **annotated PDF electronic files and directories** of each submittal.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:
a. Change of security camera locations.
b. Routing of piping and conduits.
c. Revisions to electrical circuitry.
d. Actual equipment locations.
e. Locations of concealed internal utilities.
f. Provide annotated photograph of the location of all equipment mounted in racks. Not the location of each DVR, NVR, battery backup, punch panels and similar equipment. Include building location and room number and highlight or not the equipment related to the security system.
g. Changes made by Change Order or Construction Change Directive.
h. Changes made following Architect's written orders.
i. Details not on the original Contract Drawings.
j. Field records for variable and concealed conditions.
k. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the Building name and sheet identification. Include identification in each digital data file.
4. Identification: As follows:
a. Project name.
b. Building name
c. Date.
d. Designation "PROJECT RECORD DRAWINGS."
e. Name of Architect and OPM
f. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders**,** Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Product Data.
1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect and OPM’s reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 02 4119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.
   4. Any item identified for demolition or disposal or marked with “02 4119” or “02 4100”.
   5. Disposal of any item identified by any trade as being demolished, but not salvaged or reinstalled.

B. Related Requirements:
   1. Section 01 1000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
   2. Section 01 7300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
D. Storage or sale of removed items or materials on-site is not permitted.
E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 5000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 7419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

B. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.
1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 01 7419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 04 2000
MASONRY
(FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS

A. Sub-bids shall be submitted in accordance with provisions of the Massachusetts General Laws, Chapter 149, Section 44A to 44L, inclusive, as amended. The time and place for submission of Sub-bids are set forth under the Advertisement. Procedures and requirements for submitting Sub-bids are set forth in the Instructions to Bidders.

B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a current DCAMM Sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.

C. Work to be done under this SECTION is shown on Contract Drawings numbered C101-A, AD111, AD121, A111, A121, A131, A201, A202, and A300.

D. Remaining Contract Drawings are included for reference and coordination; Each Sub-bid filed with the Awarding Authority must be accompanied by BID BOND, CASH, or CERTIFIED CHECK, or a TREASURER'S CHECK or CASHIER'S CHECK, issued by a responsible bank or trust company, payable to the **Town of Boxford** in the amount stipulated in the INSTRUCTIONS TO BIDDERS. A Sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

E. Sub-subs: Sub-sub bids are not required for this Section. Paragraph E of the Form for Sub-bid shall be left blank or marked N/A.

F. Each Sub-bid submitted for the work, under this SECTION, shall be on a form furnished by the Awarding Authority, as required by SECTION 44F of Chapter 149 of the General Laws, as amended.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Part A of the Project Manual, and Division 01 Specification Sections, apply to this Section.

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. Removal, salvage and reinstallation of existing brick and masonry accessories.
   2. Culling of existing brick to be removed for use in exterior locations exposed to view.
   3. New brick.
   4. Masonry accessories.
   5. Cleaning of masonry including, but not limited to, brick and cast stone.
   6. Repointing of brick and cast stone.
   7. Embedded flashing

B. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
   1. Install steel lintels and shelf angles for brick masonry openings greater than 12 inches or as indicated on the drawings; Section 05 5000 "Miscellaneous Metals"

C. Related Sections include the following:
   1. Division 07 – Exposed flashing

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

C. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include data on material properties material test reports substantiating compliance with requirements.
      b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
      c. For exposed brick, include test report for efflorescence according to ASTM C 67.
   2. Cementitious materials. Include brand, type, and name of manufacturer.
   3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
   4. Grout mixes. Include description of type and proportions of ingredients.
   5. Anchors, ties, and metal accessories.

D. Samples for Initial Selection:
   1. Where new brick will be installed exposed to view, provide samples of brick for the Architect to confirm match with existing exposed brick.

1.5 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
   2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 BRICK

A. Building Brick: ASTM C 62, Grade MW.
1. Where brick is exposed to view and where there is insufficient culled brick:
a. Finish: Match existing; one “light” and one “dark”.
b. Texture: Match existing

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

E. Mortar cement: ASTM C 1329

F. Water: Potable.

2.4 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.5 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar.
   2. Use portland cement-lime mortar unless otherwise indicated.
   3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for application stated unless another type is indicated.
   1. For all walls, Type N.

2.1 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use the following unless otherwise indicated:
   1. Asphalt-Coated Copper Flashing: 5-oz./sq. ft. (1.5-kg/sq. m) copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.

B. Application: Unless otherwise indicated, use the following:
   1. Where flashing is fully concealed, use flexible flashing.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.2 MISCELLANEOUS MASONRY ACCESSORIES

A. Weep/Vent Products: Use the following unless otherwise indicated:
   1. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CUTTING AND DEMOLITION

A. General: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

3.3 INSTALLATION, GENERAL

A. Use full-sized units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clear, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from culled bricks and several pallets or cubes as they are placed.
C. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.4 TOLERANCES

A. Dimensions and Locations of Elements:
1. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
B. Lines and Levels:
1. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet maximum.
2. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

3.5 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and with masonry-veneer anchors to comply with the following requirements:
1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed connector sections and continuous wire in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 25 inches (635 mm) o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. (0.25 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.
B. Provide not less than 2 inches (50 mm) of airspace between back of masonry veneer and face of insulation.
1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.6 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
B. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer,
2. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under water-resistive barrier, lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.
3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric

sealant complying with requirements in Section 07 9200 "Joint Sealants" for application indicated.

5. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 07 9200 "Joint Sealants" for application indicated.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
1. Use specified weep/cavity vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be a inconspicuous as possible.
3. Space weep holes formed from [plastic tubing] [or] [wicking material] 16 inches (400 mm) o.c.
4. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
5. Trim wicking material flush with outside face of wall after mortar has set

E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article

3.7 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated. Provide new high-strength, non-shrink, non-metallic cementitious grout bed under all bearing ends of all new steel lintel members to ensure full bearing of the bearing ends of the lintel member on the existing masonry.

C. See lintel schedule and typical lintel sections and details.

3.8 POINTING AND CLEANING (BRICK AND CAST STONE)

A. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."

3.9 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal: Remove clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, for legal disposal off Owner's property.

C. Excess Masonry Waste: Remove excess clean masonry waste and other masonry waste, and for legal disposal off Owner's property.

END OF SECTION

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SECTION 04 7200

CAST STONE MASONRY

(Part of the work of Section 04 2000 – MASONRY, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 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. Removal, salvage, and reinstallation of cast-stone trim**.** including the following:
      a. Window sills.
      b. Lintels.
      c. Surrounds.
      d. Coping.
      e. Cornices
      f. Wall caps.
      g. Belt courses.
   2. Replacement pieces of cast-stone trim including those listed above.

B. Items To Be Installed Only: Not Applicable.

C. Items To Be Furnished Only: Not Applicable.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 04 2000 "Unit Masonry" for installing cast-stone units in unit masonry.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
   1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Initial Selection: For colored mortar.

D. Samples for Verification:
   1. For each color and texture of cast stone required, 10 inches square in size.
   2. For each trim shape required, 10 inches in length.
   3. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.

E. Full-Size Samples: For each shape of cast-stone unit required.
   1. Make available for Architect's review at Project site.
   2. Make Samples from materials to be used for units used on Project.
   3. Approved Samples may be installed in the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.
   1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C1364.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C1364[**, including test for resistance to freezing and thawing**].
   1. Provide test reports based on testing within previous two years.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.

B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.

B. Pack, handle, and ship cast-stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.

2. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.7 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST-STONE MATERIALS

A. General: Comply with ASTM C1364.

B. Portland Cement: ASTM C150/C150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C114. Provide natural color or white cement as required to produce cast-stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C33/C33M; gradation and colors as needed to produce required cast-stone textures and colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C33/C33M, gradation and colors as needed to produce required cast-stone textures and colors.

E. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Use only admixtures specified or approved in writing by Architect.

1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.

2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
3. Air-Entraining Admixture: ASTM C260/C260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
4. Water-Reducing Admixture: ASTM C494/C494M, Type A.

G. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A240/A240M, ASTM A276, or ASTM A666, Type 304.

2.3 CAST-STONE UNITS

A. Cast-Stone Units: Comply with ASTM C1364.
1. Units shall be manufactured using the wet-cast method.
2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C666/C666M, Procedure A, as modified by ASTM C1364.

B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

C. Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

D. Cure Units as Follows:
1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:
a. No fewer than five days at mean daily temperature of 70 deg F or above.
b. No fewer than six days at mean daily temperature of 60 deg F or above.
c. No fewer than seven days at mean daily temperature of 50 deg F or above.
d. No fewer than eight days at mean daily temperature of 45 deg F or above.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
F. Colors and Textures: Match existing units.

2.4 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276, or ASTM A666.
B. Dowels: 1/2-inch-diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276, or ASTM A666.
C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.5 MORTAR MIXES

A. Comply with requirements in Section 04 2000 "Unit Masonry" for mortar mixes.

2.6 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to sample and test cast-stone units according to ASTM C1364.
   1. Include one test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

A. Install cast-stone units to comply with requirements in Section 04 2000 "Unit Masonry."
B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
   1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
   2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
D. Set units in full bed of mortar with full head joints unless otherwise indicated.
   1. Set units with joints 1/4 to 3/8 inch wide unless otherwise indicated.
   2. Build anchors and ties into mortar joints as units are set.
   3. Fill dowel holes and anchor slots with mortar.
   4. Build concealed flashing into mortar joints as units are set.
   5. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
   6. Keep joints at shelf angles open to receive sealant.
E. Rake out joints for pointing with sealant to depths of not less than 3/4 inch. Scrub faces of units to remove excess mortar as joints are raked.
F. Point joints with sealant to comply with applicable requirements in Section 07 9200 "Joint Sealants."
   1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
   2. Broadcast sand matching existing mortar in color into sealant while curing.
G. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.
   1. Keep joints free of mortar and other rigid materials.
   2. Build in compressible foam-plastic joint fillers where indicated.
   3. Form joint of width indicated, but not less than 3/8 inch.
   4. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
   5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 9200 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.
   1. Remove mortar fins and smears before tooling joints.
   2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
   3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
   5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
   6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION

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SECTION 05 5000
MISCELLANEOUS METALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Part A of the Project Manual, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Metal bar gratings for the attic to provide access to any new HVAC equipment that is located too far from the existing walkway.
   2. Miscellaneous angle framing and other miscellaneous metals noted on the Drawings as by section '05 5000'.
   3. Additional items indicated on the drawings to be furnished and installed 'by 05 5000' or '05 5000'

B. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:
   1. Loose steel lintels for openings as indicated on the drawings to be installed by Section 04 2000 "Masonry"
   2. Additional items indicated on the drawings to be furnished 'by 05 5000' or '05 5000'

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
   1. Additional items indicated on the drawings to be installed 'by 05 5000' or '05 5000'

D. Related Sections include the following:
   1. Section 04 2000 "Masonry"
   2. Section 04 7200 "Cast-Stone Masonry"
   3. Section 23 0001 "HVAC" for locations of HVAC equipment.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design:
   1. Structural Engineering design of all guardrails, handrails, connections and related components, and the preparation of Shop Drawing plans and engineering calculation submittals for same as required herein and by Division 1. The number, sizing, spacing and connections shown in the Contract Documents shall be considered minimum and schematic only. The actual member sizes, configurations and connections shall be determined and detailed by the Contractor and the Structural Engineer responsible for the structural engineering design of the Work under this Section.
   2. Professional structural engineering for all guardrails, handrails, connections and related components shall be provided by this Contractor as part of this scope of work of this Section. Complete Shop Drawings of guardrails, handrails, connections and related components shall be prepared.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: Manufacturers complete product data of all products proposed for use including but not limited to welded wire fabric.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

2. Submit shop drawings for each item or assembly specified. Shop drawings shall accurately and clearly show in detail the construction, sizes, gauges, dimensions, method of assembly, supports, and all other pertinent data and information required for checking.
3. Show miscellaneous metal items in related and dimensional position with elevations at a scale of 1/4 in. equals 1 ft. and details at a scale of 3 in. equals 1 ft. Control details and dimensions not governed by job conditions. Show all required field measurements.
4. Include with shop drawings all engineering computations for stairs, railings and barriers furnished under this Section, prepared and stamped by a Structural Engineer registered in the Commonwealth of Massachusetts.
5. Provide setting drawings and templates for the location of miscellaneous metal items that are to be embedded in or anchored to concrete or masonry.
6. Each field piece shall be marked plainly with suitable erection marks, which shall also be shown on the shop drawings.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
D. Certifications: Submit affidavit attesting that railings meet or exceed the design requirements specified herein, Code requirements and the regulatory agencies.
E. Submit notarized certificate of compliance from the galvanizer, stating requirements for galvanizing specified herein have been met.
F. Certification: Prior to commencing installation of materials required hereunder, furnish the Architect with certification that requirements pertaining to shop painting have been performed in the manner specified.
G. Qualification Data: For qualified professional engineer.
H. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
I. Welding certificates.
J. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, “Metal Bar Grating Manual.”
B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.3, “Structural Welding Code – Sheet Steel.”
4. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel, General: All steel shown on the Structural Drawings shall comply with the General Notes on the Structural Drawings (Sheet S-2).

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.

C. Wire Rod for Bar Grating Crossbars: ASTM A 510

D. Uncoated Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30.

E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 33, with G90 coating.

F. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

G. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

H. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

I. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

J. Steel Tubing: ASTM A 500, cold-formed steel tubing.

K. Hollow Structural Sections (HSS) “Tube” Sections: ASTM A550 Grade B.

L. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

M. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.
   3. Provide stainless-steel fasteners for fastening nickel silver.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Eyebolts: ASTM A 489.

G. Machine Screws: ASME B18.6.3.

H. Lag Screws: ASME B18.2.1.

I. Wood Screws: Flat head, ASME B18.6.1.

J. Plain Washers: Round, ASME B18.22.1.

K. Lock Washers: Helical, spring type, ASME B18.21.1.

L. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

M. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

N. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

O. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Epoxy Zinc-Rich Primer: For exterior items not specified to be galvanized, complying with MPI#20 and compatible with topcoat.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Non-Shrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

H. Non-Shrink, Non-Metallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete: Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3,000 psi for interior concrete andnormal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 5,000 psi for all exterior concrete used in walkways, sidewalks, pads, etc.

2.5 FABRICATION, GENERAL

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
F. Form exposed work with accurate angles and surfaces and straight edges.
G. Fit exposed connections accurately together to form hairline joints.
H. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
I. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
J. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
L. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.
C. Galvanize miscellaneous framing and supports where indicated.
D. Prime miscellaneous framing and supports with zinc-rich primer.

2.7 MISCELLANEOUS STEEL

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
C. Galvanize exterior miscellaneous steel trim.
D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.8 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.9 METAL BAR GRATINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. McNichols Co.
   2. All American Grating
   3. Borden Metal Products
B. Welded Steel Grating:
   1. Bearing Bar Spacing: 1-3/16 inches o.c.
   2. Bearing Bar Depth: 1-1/4 inches.
   3. Bearing Bar Thickness: 3/16 inch.
   4. Crossbar Spacing: 4 inches o.c.
   5. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface.
C. Do not notch bearing bars at supports to maintain elevation.

2.10 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Finish metal fabrications after assembly.
C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with zinc-rich primer.
C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
   1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
B. Fit exposed connections accurately together to form hairline joints.
   1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior

units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

G. Adjust railings before anchoring to ensure matching alignment at abutting joints.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Provide cleaning and touchup painting of primer at field welds, bolted connections, and abraded areas.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

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SECTION 06 1000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 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 and nailers.
B. Items To Be Installed Only: Not Applicable.
C. Items To Be Furnished Only: Not Applicable.
D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 06 1600 "Sheathing" for sheathing, subflooring, and underlayment.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
C. Exposed Framing: Framing not concealed by other construction.
D. OSB: Oriented strand board.
E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.4 ACTION 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 and net amount of preservative retained.
   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 based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Power-driven fasteners.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. 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 grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all rough carpentry unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Treatment shall not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
   3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664 and design value adjustment factors shall be calculated according to

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry unless otherwise indicated.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
2. Nailers.
3. Furring.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.
7. Northern species; NLGA.
8. Eastern softwoods; NeLMA.

C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods; No. 2 Common grade; NeLMA.
5. Northern species; No. 2 Common grade; NLGA.
6. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.6 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
   2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
   3. ICC-ES evaluation report for fastener.

I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

J. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
   1. Comply with approved fastener patterns where applicable.
   2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
   3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

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SECTION 06 1600
EXTERIOR WALL SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 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. Exterior wall sheathing on cold-formed metal framing behind masonry veneer.

B. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections: Not Applicable.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections: Not applicable.

D. Related Sections include the following:
   1. Section 06 1000 "Rough Carpentry" for plywood backing panels behind metal wall panels.
   2. Section 06 1000 "Rough Carpentry" for installation of weather barrier on exterior sheathing.
   3. Section 07 2100 "Thermal Insulation" for continuous rigid foam insulation in brick cavity.

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. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide G-P Gypsum Corporation 'Dens-Glass Gold', or equal approved by Architect.
   2. Type and Thickness: Regular, 1/2 inch thick.
   3. Size: 48 by 96 inches for vertical installation.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
B. Nails, Brads, and Staples: ASTM F 1667.
C. Power-Driven Fasteners: NES NER-272.
D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
   1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
   2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 07 9200 "Joint Sealants."
B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
   1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
   3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing with screws.
   2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
   3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
   1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
   1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.
   1. Apply elastomeric sealant to joints and over each fastener and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
   2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION

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SECTION 06 2023
INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 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. At the first-floor library areas including, but not limited to, the circulation desk, provide the following in patterns as shown on the drawings.
      a. Interior maple trim.
      b. Interior maple paneling.
   2. Hardwood and plywood at Circulation Desk.
   3. Removal, salvage, and reinstallation of existing cabinets and countertops.
   4. Any other items identified on the drawing as by “06 2023”.

B. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
   1. Millwork including counters, cabinets, shelving and other items custom fabricated for the work of this section, Section 06 4116 Cabinets and Section 12 3623.13 Countertops.

C. Items To Be Furnished Only: Not Applicable.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 06 1000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
   2. Section 09 9123 "Interior Painting" for painting of interior finish carpentry.
   3. Section 09 9300 “Staining and Transparent Finishing” for finish of wood trim and paneling.

1.3 DEFINITIONS

A. MDF: Medium-density fiberboard.
B. MDO: Plywood with a medium-density overlay on the face.
C. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors 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 and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

B. Samples: For each exposed product and for each color and texture specified.

C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

D. Samples for Verification:
   1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
   2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.
   1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
   2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

2.2 INTERIOR TRIM

A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
   1. Species and Grade: white maple, NHLA Clear.
   2. Maximum Moisture Content: 10 percent.
   3. Finger Jointing: Not allowed.
   4. Gluing for Width: Allowed.
   5. Veneered Material: Not allowed.
   6. Face Surface: Surfaced (smooth).
   7. Matching: Selected for compatible grain and color.

B. Hardwood Moldings for Transparent Finish (Stain or Clear Finish): MMPA WM 4, N-grade wood moldings made to patterns included in MMPA's "HWM/Series Hardwood Moulding Patterns."
   1. Species: Maple.
   2. Maximum Moisture Content: 9 percent.
   3. Finger Jointing: Not allowed.
   4. Matching: Selected for compatible grain and color.
   5. Finger Jointing: Not allowed.

C. Board Paneling: Interior wood-board paneling complying with MMPA WM 9.
   1. Species: Maple.
   2. Grade: Clear No. 1.
   3. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
   4. Pattern: As indicated.

2.3 HARDWOOD

A. Hardwood for transparent finish (stain or clear finish): Clear, Grade FAS NHLA.
   1. Species: Maple
   2. Maximum Moisture Content: 10 percent
   3. Finger Jointing: Not allowed.
   4. Matching: Selected for compatible grain and color
   5. Profile: As shown on drawings.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
B. Low-Emitting Materials: Adhesives shall comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
C. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
D. Installation Adhesive for Foam-Plastic Moldings: Product recommended for indicated use by foam-plastic molding manufacturer.
E. Paneling Adhesive: Comply with paneling manufacturer's written instructions for adhesives.
F. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

2.5 FABRICATION

A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
   1. Interior standing and running trim, except shoe and crown molds.
   2. Wood-board paneling.
B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.
B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
   1. Use concealed shims where necessary for alignment.
   2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.
1. Do not use pieces less than 24 inches long, except where necessary.
2. Stagger joints in adjacent and related standing and running trim.
3. Cope or Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
4. Use scarf joints for end-to-end joints.
5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
7. Install trim after gypsum-board joint finishing operations are completed.
8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
9. Fasten to prevent movement or warping.
10. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

A. Hardboard Paneling: Install according to manufacturer's written instructions.
1. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings.
2. Butt adjacent panels with moderate contact.
3. Use fasteners with prefinished heads matching paneling color.
4. Wood Stud or Furring Substrate: Install with 1-inch annular-ring shank hardboard nails.
5. Plaster or Gypsum-Board Substrate: Install with 1-5/8-inch annular-ring shank hardboard nails.
6. Nailing: Space nails 4 inches o.c. at panel perimeter and 8 inches o.c. at intermediate supports unless otherwise required by manufacturer.

3.6 CABINETS AND COUNTERTOPS

A. Provide blocking as needed for all cabinetry and countertop installation.
B. Fit all cabinets together as designed. Fasten to make monolithic.
C. Shim as needed to make all components plumb, level, flush, and true to the space and each other.
D. Secure into blocking.
E. Secure all countertops to adjacent walls and to cabinets or as required if using a metal bracket. Ensure all counters are installed securely level and fasten to brackets and adjacent walls.

3.7 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.
1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
B. Adjust joinery for uniform appearance.

3.8 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces.
B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.9 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.
B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

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SECTION 06 4113
WOOD-VENEER-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. The removal and reinstallation of wood-veneer-faced architectural cabinets.
   2. Wood furring, blocking, shims, and hanging strips for installing architectural cabinets that are not concealed within other construction.

B. Related Requirements:
   1. Section 06 1000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Drawings: For existing architectural cabinets.
   1. Include plans, elevations, sections, and attachment details.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for items installed in architectural cabinets.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Licensed participant in AWI's Quality Certification Program or Licensed participant in WI's Certified Compliance Program.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other existing cabinets.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with cabinet surface.
   1. For shop-finished items, use filler matching finish of items being installed.

C. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
   1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
   2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   3. Maintain veneer sequence matching of cabinets with transparent finish.
   4. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c.

3.3 FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program or WI's Certified Compliance Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
   1. Inspection entity shall prepare and submit report of inspection.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces. Touch up finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Rigid insulation to be used in masonry walls.
   2. Mineral-wool blanket insulation to be used as indicated on the drawings and elsewhere in the Project Manual.
   3. Vapor barrier.

B. Items To Be Installed Only: Not Applicable.

C. Items To Be Furnished Only: Not Applicable.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 04 2000 "Unit Masonry" for insulation installed in masonry veneer walls.
   2. Section 06 1600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Glass-fiber blanket insulation.
   2. Mineral-wool blanket insulation.

1.4 INFORMATIONAL SUBMITTALS

A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
   1. Sign, date, and post the certification in a conspicuous location on Project site.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Research Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to 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 RIGID FOAM BOARD INSULATION

A. Extruded Polystyrene Board Insulation: Complies with ASTM C578 Type X. Meets IBC/IRC requirements for foam plastic insulation. Meets CAN/ULC S701 Type 3. See ESR-2142, BOCA-ES RR 21-02. UL Classified, see Classification Certificate D369.
   1. Basis of Design: Styrofoam Cavity Mate by Dow Chemical. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. R-5 per inch
   2. Other manufacturers seen as equals and acceptable:
      a. Atlas Roofing Corporation.
      b. Dyplast Products

c. John Mansville

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 MINERAL-WOOL BLANKET INSULATION

A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type IA (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Johns Manville; a Berkshire Hathaway company.
      b. Rockwool International.
      c. Thermafiber, Inc.; an Owens Corning company.
   2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
   3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
   4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.3 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

2.4 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Install insulation with manufacturer's R-value label exposed after insulation is installed.

D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Rigid Foam Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
   5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
      a. Exterior Walls: Set units with facing placed toward **interior of construction.**

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
   2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. 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

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SECTION 07 2119
FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 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. Closed-cell spray polyurethane foam to be used at the gable ends in the attic.
   2. Low-rise open-cell spray polyurethane foam to be used around the wood windows.

B. Related Requirements:
   1. Section 07 2100 "Thermal Insulation" for foam-plastic board insulation.
   2. Section 08 5200 “Wood Windows” for windows.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES .

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Carlisle Spray Foam Insulation.
      b. Gaco Western LLC.
      c. Icynene-Lapolla; Icynene.
   2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 75 or less.
      b. Smoke-Developed Index: 450 or less.
   3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 OPEN-CELL SPRAY POLYURETHANE FOAM

A. Low-Rise Open-Cell Spray Polyurethane Foam: Spray-applied polyurethane foam using water as a blowing agent. Minimum density of 0.4 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 3.4 deg F x h x sq. ft./Btu at 75 deg F.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Spray Foam Insulation.
   b. Gaco Western LLC.
   c. Icynene-Lapolla; Icynene.
2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 75 or less.
   b. Smoke-Developed Index: 450 or less.
3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.3 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.
B. Ignition Barrier: Provide manufacturer recommended ignition barrier as required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.
B. Spray insulation to envelop entire area to be insulated and fill voids.
C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.
E. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

SECTION 07 3113

ROOFING ASPHALT SHINGLES

(Part of the work of Section 07 6200 – SHEET METAL FLASHING AND TRIM, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 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. Asphalt shingles where indicated on the drawings.
   2. Roofing shingle accessories.
B. Items To Be Installed Only: None
C. Items To Be Furnished Only: None
D. Related Sections:
   1. Division 06 Section "Rough Carpentry" for wood framing and sheathing.
   2. Division 07 Section "Sheet Metal Flashing and Trim", for installation of metal flashing that interfaces with the work of this Section.

1.3 DEFINITION

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples for Initial Selection: Manufacturer's standard sample board showing full range of colors and textures.
   1. Include similar Samples of trim and accessories involving color selection.
C. Samples for Verification: For the following products, of sizes indicated, to verify color selected:
   1. Asphalt Shingle: Full size.
   2. Felt Underlayment: 12-inch x 12-inch sample.
D. Qualification Data: For qualified Installer.
E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.
F. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.
G. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
B. Source Limitations: Obtain ridge and hip cap shingles from single source manufacturer and same as shingles.
C. Fire-Resistance Characteristics: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
   1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for sloped roof.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
   1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.7 WARRANTY

A. Roofing Contractor's Warranty: The roofing subcontractor shall supply a minimum two-year workmanship warranty. In the event any work related to the roofing or flashing is found to be defective within two years of substantial completion, the roofing contractor shall remove and replace such at no additional cost. The roofing subcontractor's warranty obligation shall run directly to the building owner, and a copy of the roofing signed warranty shall be stent to the roofing system's manufacturer.

B. There is a current active warranty on the existing asphalt shingle roof installation. All work shall be performed such as to not null that warranty.

C. It shall be the roofing subcontractor's responsibility to coordinate inspections and other certifications as required by the manufacturer and other entities, if any, to secure warranty as required.

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. Asphalt Shingles: 100 sq. ft of each type, in unbroken bundles.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Multitab-Strip Asphalt Shingles: ASTM D 3462, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
   1. Basis-of-Design TBD, match existing.:
      a. CertainTeed Corporation.
      b. GAF Materials Corporation.
      c. Owens Corning.
   2. Tab Arrangement: Match existing
   3. Cutout Shape: Tapered.
   4. Butt Edge: Straight cut.
   5. Strip Size: 12" x 36"; 4 bundles per square
   6. Algae Resistance: Granules treated to resist algae discoloration.
   7. Color and Blends: As selected by Architect from manufacturer's full range. It is the intent to match the existing.

2.2 UNDERLAYMENT MATERIALS

A. Felt Building Paper: ASTM D 226, Type II, 15# asphalt-saturated organic felts, nonperforated.

2.3 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
   1. Nails: Standard round wire-type roofing nails, corrosion resistant; hot dipped zinc coated steel, aluminum, or chromated steel; minimum 3/8 inch (9.5 mm) head diameter; minimum 11 or 12 gage (2.5 mm) shank diameter; shank to be of sufficient length to penetrate through roof sheathing Where nails are in contact with metal flashing, use nails made from same metal as flashing.

B. Felt Underlayment Nails: Stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Single-Layer Felt Underlayment: Install on self-adhering sheet on roof deck parallel with and starting at the eaves. Lap sides a minimum of 4 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with roofing nails.
   1. Install fasteners at no more than 36 inch o.c.

3.3 ASPHALT SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual", but using instructions per this specification Section, Article 3.3-F as a minimum fastening schedule.

B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed at least 7 inches wide with self-sealing strip face up at roof edge.
   1. Extend asphalt shingles 3/8 inch over fasciae at eaves and rakes.
   2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.

E. Fasten asphalt shingle strips with a minimum of six (6) roofing nails located according to manufacturer's written instructions when regulation calls for six (6) or fewer nails. Follow regulations if more than six (6) nails are required.
   1. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

END OF SECTION

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SECTION 07 6200
SHEET METAL FLASHING AND TRIM
(FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS

A. Sub-bids shall be submitted in accordance with provisions of the Massachusetts General Laws, Chapter 149, Section 44A to 44L, inclusive, as amended. The time and place for submission of Sub-bids are set forth under the Advertisement. Procedures and requirements for submitting Sub-bids are set forth in the Instructions to Bidders.

B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a current DCAMM Sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.

C. Work to be done under this SECTION is shown on Contract Drawings numbered AD111, AD121, A121, A131, A141, A201, A202, and A300.

D. Remaining Contract Drawings are included for reference and coordination; Each Sub-bid filed with the Awarding Authority must be accompanied by BID BOND, CASH, or CERTIFIED CHECK, or a TREASURER'S CHECK or CASHIER'S CHECK, issued by a responsible bank or trust company, payable to the **Town of Boxford** in the amount stipulated in the INSTRUCTIONS TO BIDDERS. A Sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

E. Sub-subs: Sub-sub bids are not required for this Section. Paragraph E of the Form for Sub-bid shall be left blank or marked N/A.

F. Each Sub-bid submitted for the work, under this SECTION, shall be on a form furnished by the Awarding Authority, as required by SECTION 44F of Chapter 149 of the General Laws, as amended.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section Includes:
   1. Manufactured reglets with counterflashing.
   2. Formed steep-slope roof sheet metal fabrications.
   3. Formed wall sheet metal fabrications.

B. Related Requirements:
   1. Section 06 1000 "Rough Carpentry" for wood nailers, curbs, and blocking.

1.4 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following
   1. Underlayment materials.
   2. Elastomeric sealant.
   3. Butyl sealant.
   4. Epoxy seam sealer.

B. Shop Drawings: For sheet metal flashing and trim.
   1. Include plans, elevations, sections, and attachment details.

2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of edge conditions, including eaves, ridges, rakes, crickets, flashings, and counterflashings.
8. Include details of special conditions.
9. Include details of connections to adjoining work.
10. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches

C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.
D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
E. Samples for Verification: For each type of exposed finish.
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Samples to show full range to be expected for each.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.
B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.
C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
D. Evaluation Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.
E. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.
B. Special warranty.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.
B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Hussey Copper Ltd.
      b. Revere Copper Products, Inc.
   2. Source Limitations: Obtain sheet from single source from single manufacturer.
   3. Nonpatinated, Exposed Finish: Mill.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
b. Owens Corning.
c. Polyglass U.S.A., Inc.

2. Source Limitations: Obtain underlayment from single source from single manufacturer.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal**.**

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
2. Fasteners for Copper Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.

C. Solder:

1. For Copper: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead with maximum lead content of 0.2 percent.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

I. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Fry Reglet Corporation.
   b. Keystone Flashing Company, Inc.
   c. National Sheet Metal Systems, Inc.
2. Source Limitations: Obtain reglets from single source from single manufacturer.
3. Material: Copper, 16 oz./sq. ft..
4. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
6. Accessories:
   a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing.
   b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
7. Finish: Mill.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
   1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
   4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:
   1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
   2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:
   1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, solder watertight.
   1. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate Fabricate from the following materials:
      a. Copper: 24 oz./sq. ft..

B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Copper: 20 oz./sq. ft..)

C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft..

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.

B. Drip Edges: Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.
C. Eave, Rake, Flashing: Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.
D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.
B. Opening Flashings in Frame Construction: Fabricate head, sill and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 6-inch high, end dams. Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment:
   1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
   2. Prime substrate if recommended by underlayment manufacturer.
   3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
   4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
   5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
   6. Roll laps and edges with roller.
   7. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
   1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder.
   3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.

4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
7. Do not field cut sheet metal flashing and trim by torch.
8. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
   a. Embed hooked flanges of joint members not less than 1 inch into sealant.
   b. Form joints to completely conceal sealant.
   c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
   d. Adjust setting proportionately for installation at higher ambient temperatures.
      1) Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 9200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint.
   a. Fill joint completely.
   b. Completely remove flux and spatter from exposed surfaces.
4. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

3.4 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:
1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings:
   1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
   2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
   3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
   1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
   2. Extend counterflashing 4 inches over base flashing.
   3. Lap counterflashing joints minimum of 4 inches.

3.5 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill and similar flashings to extend 4 inchesbeyond wall openings.

C. Reglets: Installation of reglets is specified in Section 04 2000 "Unit Masonry."

3.6 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 07 7100

ROOF SPECIALTIES

(Part of Work of Section 07 6200 – SHEET METAL FLASHING AND TRIM, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Roof-edge drainage systems.
B. Related Requirements:
   1. Section 07 3000 "Roofing Asphalt Shingles" for roofing.
C. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
   2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Shop Drawings: For roof specialties.
   1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
   2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
   3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
   4. Detail termination points and assemblies, including fixed points.
   5. Include details of special conditions.
C. Samples: For each type of roof specialty and for each color and texture specified.
D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
E. Samples for Verification:
   1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
   2. Include roof-edge drainage systems made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.
B. Product Certificates: For each type of roof specialty.
C. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class and SPRI ES-1 tested to specified design pressure.

B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.
   1. Build mockup of typical roof edge as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ROOF-EDGE DRAINAGE SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Architectural Products Company.
   2. ATAS International, Inc.
   3. CopperCraft by FABRAL.

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
   1. Copper Sheet: 20 oz./sq. ft..
   2. Gutter Profile: Half-round double bead according to SMACNA's "Architectural Sheet Metal Manual."
   3. Corners: Factory mitered and soldered.

4. Gutter Supports: Hidden half round gutter brackets with rods, with finish matching the gutters.
5. Gutter Accessories: Bronze wire ball downspout strainer and Bullnose ends for half-round gutter.

C. Downspouts: Plain round. complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
1. Copper: 16 oz./sq. ft.

D. Copper Finish: Non-patinated, mill.

2.3 MATERIALS

A. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.

B. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

F. Solder for Copper: ASTM B32, lead-free solder.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Copper Sheet Finishes:
1. Non-Patinated Finish: Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.3 INSTALLATION OF ROOF-EDGE SPECIALITIES

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.4 INSTALLATION OF ROOF-EDGE DRAINAGE-SYSTEM

A. Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 12 inches apart. Attach ends with rivets and solder to make watertight. Slope to downspouts.
1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
1. Provide elbows at base of downspouts at grade to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal

filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 07 8413
PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 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 construction, including both empty openings and openings containing penetrating items.
   2. Through-penetration firestop systems for penetrations through vertical and horizontal construction separating rooms **even if the existing assembly is not fire rated**.

B. Items To Be Installed Only: Not Applicable.

C. Items To Be Furnished Only: Not Applicable.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Firestopping of all penetrations of conduits, wiring, piping, ductwork, and other items penetrating partitions shall be provided by the Trade Sections (Division 22 “Plumbing”, Division 23 “HVAC”, and Division 26 “Electrical”). Firestopping provided by those sections shall comply with the requirements of this Section.
   2. Division 07 “Joint Sealants” for standard joint sealers.
   3. Division 09 “Gypsum Board Assemblies” for gypsum assemblies.
   4. Division 22 “Plumbing” for piping penetrations.
   5. Division 23 “HVAC” for duct and piping penetrations.
   6. Division 26 “Electrical” for cable and conduit penetrations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
1) UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Tremco, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. F-Rating: Not less than the fire-resistance rating of constructions penetrated or 1 hour, whichever is higher.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
1. Permanent forming/damming/backing materials.
2. Substrate primers.

2.3 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
C. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
D. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

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 the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with 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 penetration firestopping materials.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.
B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
B. Install forming 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.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
C. Install fill materials by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
   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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
   1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove

penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping 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 penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.6 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B.

PART 4 - CONCRETE FLOORS		**UL-CLASSIFIED SYSTEMS**			**CONCRETE OR BLOCK WALLS**		**UL-CLASSIFIED SYSTEMS**		
TYPE OF PENETRANT	**F-RATING HR**	**HILTI**	**3M**	**BIO-FIRE**	**TYPE OF PENETRANT**	**F-RATING**	**HILTI**	**3M**	**BIO-FIRE**
CIRCULAR BLANK OPENINGS	1	FA 0006, CAJ 0070	CAJ 0009	CAJ 0056	CIRCULAR BLANK OPENINGS	1	CAJ 0055, CAJ 0070	CAJ 0009	CAJ 0056
	2	FA 0006, CAJ 0070	CAJ 0009	CAJ 0056		2	CAJ 0055, CAJ 0070	CAJ 0009	CAJ 0056
	3	CAJ 0055	CAJ 0009	CAJ 0056		3	CAJ 0055	CAJ 0009	CAJ 0056
SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, CAJ 1278, FA 1017	CAJ 1058	CAJ 1264	SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, CAJ 1278,	CAJ 1058	CAJ 1264
	2	CAJ 1226, CAJ 1278, FA 1017	CAJ 1058	CAJ 1264		2	CAJ 1226, CAJ 1278,	CAJ 1058	CAJ 1264
	3	CAJ 1226, CAJ 1278, FA 1017	CAJ 1058	CAJ 1264		3	CAJ 1226, CAJ 1278,	CAJ 1058	CAJ 1264
	4	CAJ 8095, CBJ 1034	CAJ 1044	N/A		4	CAJ 8095, CBJ 1034, WJ 1042	CAJ 1044	WJ 1064

SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, ENT)	1	CAJ 2109, CAJ 2168, FA 2054, FA 2067	CAJ 2189, CAJ 2117, CAJ 2027	CAJ 2131	SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, ENT)	1	CAJ 2109, WJ 2108, WJ 2121	CAJ 2189, CAJ 2117, CAJ 2027	CAJ 2131
	2	CAJ 2109, CAJ 2168, FA 2054, FA 2067	CAJ 2189, CAJ 2117	CAJ 2131		2	CAJ 2109, WJ 2108, WJ 2121	CAJ 2189, CAJ 2117, CAJ 2027	CAJ2131
	3	CAJ 2109, CAJ 2168, FA 2054,	CAJ 2005, CAJ 2117	CAJ 2152		3	CAJ 2109, CAJ 2168, WJ 2091	CAJ 2005, CAJ 2117, CAJ 2027	CAJ2152
	4	N/A*	N/A*	N/A		4	WJ 2091	N/A*	N/A
SINGLE OR BUNDLED CABLES	1	FA 3007, CAJ 3095,	CAJ 3021	CAJ 3103	SINGLE OR BUNDLED CABLES	1	CAJ 3095, WJ 3060 WJ 3074	CAJ 3021	WJ 3071
	2	FA 3007, CAJ 3095,	CAJ 3021	CAJ 3103		2	CAJ 3095, WJ 3060 WJ 3074	CAJ 3021	WJ 3071
	3	FA 3007, CAJ 3095,	CAJ 3030	CAJ 3103		3	CAJ 3095, WJ 3050	CAJ 3030	CAJ 3103
	4	N/A*	N/A*	N/A		4	WJ 3050	N/A*	N/A
CABLE TRAY	1	CAJ 4034, CAJ 4054, CAJ 4017	CAJ 4003	CAJ 4048	CABLE TRAY	1	CAJ 4034, CAJ 4054, WJ 4016,	CAJ 4003	CAJ 4048
	2	CAJ 4034, CAJ 4054, CAJ 4017	CAJ 4003	CAJ 4048		2	CAJ 4034, CAJ 4054, WJ 4016,	CAJ 4003	CAJ 4048
	3	CAJ 4034, CAJ 4017	CAJ 4003	CAJ 4048		3	CAJ 4034, WJ 8007	CAJ 4003	CAJ 4048
	4	N/A*	N/A*	N/A		4	WJ 8007	N/A*	N/A
SINGLE INSULATED PIPES	1	FA 5016, FA 5017 CAJ 5090, CAJ 5091,	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082	SINGLE INSULATED PIPES	1	CAJ 5090, CAJ 5091, WJ 5042	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
	2	FA 5016, FA 5017 CAJ 5090, CAJ 5091,	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082		2	CAJ 5090, CAJ 5091, WJ 5042	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
	3	FA5016, CAJ 5061, CAJ 5090,	CAJ 5024, CAJ 5017	CAJ 5006		3	CAJ 5090, CAJ 5091,	CAJ 5024, CAJ 5017	CAJ 5006
	4	CBJ 5006	N/A*	N/A		4	WJ 5028, CBJ 5006	N/A*	N/A

ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	CAJ 6026	ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	CAJ 6026
	2	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	CAJ 6026		2	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	CAJ 6026
	3	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	N/A		3	CAJ 6006, CAJ 6017	CAJ 6001, CAJ 6002	N/A
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046 CAJ 7051	CAJ 7003, CAJ 7021	CAJ 7036	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046, WJ 7029, WJ 7022	CAJ 7003, CAJ 7021	CAJ 7036
	2	CAJ 7046 CAJ 7051	CAJ 7003, CAJ 7021	N/A		2	CAJ 7046, WJ 7029, WJ 7022	CAJ 7003, CAJ 7021	CAJ 7036
	3	CAJ 7046 CAJ 7051	CAJ 7003, CAJ 7021	N/A		3	CAJ 7046 CAJ 7051	CAJ 7003, CAJ 7021	N/A
MIXED PENETRANTS	1	CAJ 8056, CAJ 8095, CAJ 8099	CAJ 8001, CAJ 8013	CAJ 8051	MIXED PENETRANTS	1	CAJ 8096, CAJ 8099 WJ 8007	CAJ 8001, CAJ 8013	CAJ 8051
	2	CAJ 8056, CAJ 8095, CAJ 8099	CAJ 8001, CAJ 8013	CAJ 8051		2	CAJ 8096, CAJ 8099 WJ 8007	CAJ 8001, CAJ 8013	CAJ 8051
	3	CAJ 8056, CAJ 8095, CAJ 8099	CAJ 8001, CAJ 8013	CAJ 8051		3	CAJ 8099 WJ 8007	CAJ 8001, CAJ 8013	CAJ 8051
	4	CAJ 8095	N/A*	N/A		4	WJ 8007	N/A*	N/A
WOOD FLOORS		**UL-CLASSIFIED SYSTEMS**			**GYPSUM WALLBOARD ASSEMBLIES**		**UL-CLASSIFIED SYSTEMS**		
TYPE OF PENETRANT	**F-RATING**	**HILTI**	**3M**	**BIO-FIRE**	**TYPE OF PENETRANT**	**F-RATING**	**HILTI**	**3M**	**BIO-FIRE**
METAL PIPES OR CONDUIT	1	FC 1009, FC 1059	FC 1002	FC 1031	METAL PIPES OR CONDUIT	1	WL 1054, WL 1164	WL 1146	WL 1115
						2	WL 1054, WL 1164	WL 1010, WL 1146	WL 1115
	2	FC 1009, FC 1059	FC 1002	FC 1031		4	WL 1110	WL 1001	
NON-METALLIC PIPE OR	1	FC 2025, FC 2126	FC 2024	FC 2059	NON-METALLIC PIPE OR	1	WL 2078, WL 2075, WL 2128	WL 2088, WL 2002	WL 2133

CONDUIT					CONDUIT				
						2	WL 2078, WL 2075, WL 2128	WL 2088, WL 2002	WL 2133
	2	FC 2025, FC 2126	FC 2024	FC 2059					
						4	WL 2184, WL 2245	N/A*	
SINGLE OR BUNDLED CABLES	1	FC 3012, FC 3044	FC 3017	FC 3050	SINGLE OR BUNDLED CABLES	1	WL 3065	WL 3032, WL 3030	WL 3153
						2	WL 3065	WL 3032, WL 3030	WL 3153
						4	WL 3139	N/A*	
	2	FC 3012	FC 3017	N/A					
					CABLE TRAY	1	WL 4011, WL 4019	WL 4004	WL 4032
						2	WL 4011, WL 4019	WL 4004	WL 4032
						4	WL 8014	N/A*	
INSULATED PIPES	1	FC 5004, FC 5036, FC 5037	FC 5014	FC 5025	INSULATED PIPES	1	WL 5029, WL 5096	WL 5040, WL 5001, WL 5032	WL 5062
						2	WL 5029, WL 5096	WL 5040, WL 5001, WL 5032	WL 5062
	2	FC 5004	N/A*	FC 5025		4 4	WL 5073 WL 5073	N/A*	
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	FC 7013	FC 7001		NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	WL 7040, WL 7042	WL 7008	WL 7037
						2 4	WL 7040, WL 7042	WL 7008, WL 7013, WL 7016	WL 7037
MIXED PENETRANTS	1	FC 8014, FC 8026	FC 8013	N/A	MIXED PENETRANTS	1	WL 8004, WL 8013	WL 8010	WL 8017
						2	WL 8004, WL 8013	WL 8010, WL 8002	WL 8017
	2	N/A*	N/A*	N/A		4 4	WL 8014 WL 8014	N/A*	

* No UL-Classified system is available as of August 2003. Engineer Judgement Drawing Required

NOTES:
1. Jobsite conditions of each through-penetration firestop system must meet all details of the UL-Classified System selected.

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 judgement drawing.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Nonstaining silicone joint sealants.
   3. Butyl joint sealants.
   4. Latex joint sealants.
   5. Sealant with sand rubbed in for vertical joints in the cast stone.

B. Related Requirements:
   1. Section 07 6200"Sheet Metal Flashing and Trim," for Flashings.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.
B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.
C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
   1. Sealant # 1 for exterior non traffic joints that do not abut masonry or concrete.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. GE Construction Sealants; Momentive Performance Materials Inc.
      b. Pecora Corporation.
      c. Permathane®/Acryl-R®; ITW Polymers Sealants North America.
      d. Polymeric Systems, Inc.
      e. Sherwin-Williams Company (The).
      f. The Dow Chemical Company.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
   1. Sealant # 2 for exterior non traffic joints that abut masonry or concrete surfaces.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. May National Associates, Inc.; a subsidiary of Sika Corporation.
      b. Pecora Corporation.
      c. Sika Corporation; Joint Sealants.
      d. Tremco Incorporated.

2.4 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.
   1. Sealant # 3 for exterior non traffic surfaces.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Bostik, Inc.
      b. Pecora Corporation.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
   1. Sealant # 4 for interior non traffic surfaces.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. May National Associates, Inc.; a subsidiary of Sika Corporation.
      b. Pecora Corporation.
      c. Sherwin-Williams Company (The).
      d. Tremco Incorporated.

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Adfast.
      b. Alcot Plastics Ltd.
      c. BASF Corporation.
      d. Construction Foam Products; a division of Nomaco, Inc.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

2.8 SAND

A. Mortar sand for application onto sealant joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    a. Masonry.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.
   4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C1193.

3.4 APPLYING SAND INTO SEALANT JOINTS

A. At sealant joints that call for sand in the joints, rake out existing mortar to a depth of 1-1/4”.

B. Apply backer rods and sealant as specified in Article 3.3 of this section.

C. When sealant is set but not cured, manually apply sand to the wet sealant. Press the sand into the sealant without smearing the wet sealant.

D. Apply the sand to simulate mortar joints, provide UV protection for the sealant, and cover the sealant from airborne contaminants.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

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SECTION 08 1213
HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Standard and custom hollow metal frames for doors and interior windows.

B. Related Sections:
   1. Division 08 Section “Stile and Rail Wood Doors”.
   2. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
   3. Division 08 Section "Door Hardware".
   4. Division 09 Sections "Interior Painting" for field painting hollow metal frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
   3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
   6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
   10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:
   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 anchorages, joints, field splices, and connections.
   6. Details of accessories.
   7. Details of moldings, removable stops, and glazing.
   8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
B. 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-inchhigh wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inchspace between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

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.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CECO Door Products (C).
   2. Curries Company (CU).
   3. Steelcraft (S).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.
C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 metallic coating.

2.3 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
B. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 16 gauge (0.053-inch -thick steel sheet.
   3. Manufacturers Basis of Design:
      a. Curries Company (CU) - M Series.
C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.4 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud Wall Type: Designed to engage stud and not less than 0.042 inchthick.
   2. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inchesthick.

2.5 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal components.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 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. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
C. Hollow Metal Frames:
   1. Shipping Limitations: 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.
   2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
   3. 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 incheshigh.
   2) Four anchors per jamb from 60 to 90 incheshigh.
   3) Five anchors per jamb from 90 to 96 incheshigh.
   4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inchesor fraction thereof above 96 incheshigh.
   5) Two anchors per head for frames above 42 incheswide and mounted in metal stud partitions.

4. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

D. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 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 Division 26 Sections.

2.8 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
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; and compatible with substrate and field-applied coatings.

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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
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 square, level, twist, and plumb condition.
C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
D. Drill and tap doors and frames to receive non-template, 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 and NFPA 80 at fire rated openings.
   1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.

C. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

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 and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION

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SECTION 08 1433
STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Interior stile and rail wood doors.
2. Factory fitting stile and rail wood doors to frames and factory machining for hardware.
3. Factory priming finishing.

B. Related Requirements:
4. Section 06 4214 "Stile and Rail Wood Paneling" for requirements for veneers from the same flitches for both wood paneling and stile and rail wood doors.
5. Section 09 9300 "Staining and Transparent Finishing" for field finishing stile and rail doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:
6. Details of construction and glazing.
7. Door frame construction.
8. Factory-machining criteria.
9. Factory- priming finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:
10. Door schedule indicating door location, type, size, fire protection rating, and swing.
11. Door elevations, dimensions and location of hardware, lite locations, and glazing thickness.
12. Details of frame for each frame type, including dimensions and profile.
13. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
14. Dimensions and locations of mortises and holes for hardware.
15. Clearances and undercuts.
16. Requirements for veneer matching.
17. Doors to be factory primed finished and application requirements.
18. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Verification:
19. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
20. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

1.4 CLOSEOUT SUBMITTALS.

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.
B. Package doors individually in opaque plastic bags or cardboard cartons.
C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity levels designed for building occupants for the remainder of construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors and frames that fail in materials or workmanship within specified warranty period.
   21. Failures include, but are not limited to, the following:
      a. Delamination of veneer.
      b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
      c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
   22. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   23. Warranty shall be in effect during specified period of time from date of Substantial Completion.
   24. Warranty Period for Interior Doors: Five years .
   25. Insulating Glass Vision Panels: Five years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain stile and rail wood doors from single manufacturer.

2.2 MATERIALS

A. Use only materials that comply with referenced standards and other requirements specified.
   26. Assemble interior doors, including components, with either dry-use or wet-use adhesives complying with ASTM D5572 for finger joints and with ASTM D5751 for joints other than finger joints.

B. Panel Products: Any of the following unless otherwise indicated:
   27. Particleboard: ANSI A208.1, Grade M-2.
   28. Medium-density fiberboard (MDF,) complying with ANSI A208.2, Grade 130.
   29. Hardboard complying with ANSI A135.4.
   30. Veneer-core plywood.

2.3 INTERIOR STILE AND RAIL WOOD DOORS

A. Interior Stile and Rail Wood Doors: Interior stock doors complying with and with other requirements specified.
   31. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Assa Abloy, Maiman.
      b. Masonite Architectural.
      c. VT Industries Inc.
   32. Performance Grade: WDMA I.S. 6A Heavy Duty .
   33. Panel Designs: Indicated on Drawings. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review. It is the intention to match the existing door panel design. Should there be any discrepancy between the design on the drawings and the existing doors, the existing doors's panel design takes precedence.
   34. Finish: Transparent .
   35. Wood Species and Cut for Transparent Finish: Maple .

36. Door Construction for Transparent Finish:
    a. Stile and Rail Construction: Veneered, structural composite lumber or veneered, edge- and end-glued clear lumber. Select veneers for similarity of grain and color, and arrange for optimum match between adjacent pieces. Use veneers not less than 1/16 inch thick.
    b. Raised-Panel Construction: Veneered, shaped, wood-based panel product with veneer conforming to raised-panel shape.
37. Stile and Rail Widths: Manufacturer's standard, but not less than the following:
    a. Stiles, Top and Intermediate Rails: Match existing .
    b. Bottom Rails: 9 inches Match existing .
38. Raised-Panel Thickness: Manufacturer's standard, but not less than 3/4 inch . It is the intent to match the existing doors.
39. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
40. Glass: Uncoated, clear, fully tempered float glass, 5.0 mm thick , complying with Section 08 8000 "Glazing."
41. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S. 6A and grade specified.

2.4 STILE AND RAIL WOOD DOOR FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:
    42. Clearances:
        a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
        b. Provide 1/2 inch from bottom of door to top of decorative floor finish or covering.
        c. Where threshold is shown on Drawings or scheduled, provide not more than 3/8 inch from bottom of door to top of threshold.
        d. Comply with NFPA 80 requirements for fire-rated doors.
    43. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
    44. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.

B. Factory machine doors for hardware that is not surface applied.
    45. Locate hardware to comply with DHI-WDHS-3.
    46. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
    47. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
    48. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Glazed Openings: Trim openings indicated for glazing with solid-wood moldings, with one side removable. Miter wood moldings at corner joints.

2.5 POCKET DOORS

A. Pocket doors shall match style and rail swing doors, except that they shall not have glazed openings.
B. Factory machine pocket doors to receive pocket door hardware.
C. Coordinate partition construction with pocket door submittals.

2.6 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.
    49. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
    50. Finish faces, all four edges, edges of cutouts, and mortises.
    51. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors that are indicated to receive transparent finish.

C. Transparent Finish:
   52. Architectural Woodwork Standards Grade: Premium.
   53. Finish: Architectural Woodwork Standards System 10, UV Curable, Water Based.
   54. Staining: Match Architect's sample.
   55. Effect: Filled finish .
   56. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
   57. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   58. Reject doors with defects.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 08 7100 "Door Hardware."
B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
   59. Install smoke- and draft-control doors according to NFPA 105.
C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
D. Factory- Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.
B. 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

SECTION 08 5200
WOOD WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes vinyl-clad wood windows.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for wood windows.

B. Shop Drawings: For wood windows.
   2. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples for Initial Selection: For units with factory-applied finishes.
   3. Include Samples of hardware and accessories involving color selection.

D. Samples for Verification: For wood windows and components required, prepared on Samples of size indicated below:
   4. Exposed Finishes: 2 by 4 inches .
   5. Exposed Hardware: Full-size units.

E. Product Schedule: For wood windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each type of wood window, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to wood window manufacturer for installation of units required for this Project.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   6. Build mockup of typical wall area as shown on Drawings.
   7. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   8. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.
   9. Failures include, but are not limited to, the following:
      a. Failure to meet performance requirements.
      b. Structural failures including excessive deflection, water leakage, and air infiltration.
      c. Faulty operation of movable sash and hardware.

d. Deterioration of materials and finishes beyond normal weathering.
e. Failure of insulating glass.

10. Warranty Period:
    a. Window: 10 years from date of Substantial Completion.
    b. Glazing Units: 10 years from date of Substantial Completion.
    c. Vinyl Cladding: Lifetime warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wood windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
   11. Window Certification: WDMA certified with label attached to each window.
B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
   12. Minimum Performance Class: CW .
   13. Minimum Performance Grade: 30 .
C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40 .

2.3 WOOD WINDOWS

A. Vinyl-Clad Wood Windows:
   14. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
       a. Andersen Windows; Andersen Corporation.
       b. Weather Shield Mfg., Inc.
B. Operating Types: Provide the following operating types in locations indicated on Drawings:
   15. Double hung.
C. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.
   16. Exterior Finish: Vinyl-clad wood.
       a. Color: As selected by Architect from manufacturer's full range .
   17. Interior Finish: .
       a. Color: As selected by Architect from manufacturer's full range .
D. Insulating-Glass Units: ASTM E 2190.
   18. Glass: ASTM C 1036, Type 1, Class 1, q3.
       a. Tint: Clear .
   19. Lites: Two .
   20. Filling: Fill space between glass lites with argon.
   21. Low-E Coating: Sputtered on third surface .
E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal .
F. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
   22. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range .
G. Hung Window Hardware:

23. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
24. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.
25. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

I. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

26. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

A. Dividers (False Muntins): Provide divider grilles in designs indicated for each sash lite.

27. Quantity and Type: Two per sash, permanently located at exterior and interior lites .
28. Material: Manufacturer's standard .
29. Pattern: As indicated on Drawings .
30. Profile: As selected by Architect from manufacturer's full range .
31. Color: As selected by Architect from manufacturer's full range .

2.5 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

32. Type and Location: Full, outside for double-hung sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

33. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
34. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range .
35. Finish for Exterior Screens: Matching color and finish of cladding .

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch-diameter, coated aluminum wire.

36. Wire-Fabric Finish: Charcoal gray .

2.6 FABRICATION

A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze wood windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
   37. Keep protective films and coverings in place until final cleaning.
C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes door hardware for the following:
   1. Swinging doors.
   2. Pocket doors.
B. Products installed but not furnished under this section:
   1. None.
C. Products furnished but not installed under this section:
   1. None.
D. Related Requirements:
   1. Section 08 1213 "Hollow Metal Frames"
   2. Section 08 1433 "Stile and Rail Wood Doors"

1.3 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. 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. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
C. 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.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Samples for Initial Selection: For each type of exposed finish.
C. Samples for Verification: For each type of exposed product, in each finish specified.
   1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.
      a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
   2. Tag Samples with full product description to coordinate Samples with door hardware schedule.
D. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Submittal Sequence: Submit door hardware schedule after or concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.

2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
3. Content: Include the following information:
    a. Identification number, location, hand, fire rating, size, and material of each door and frame.
    b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
    c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
    d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
    e. Fastenings and other installation information.
    f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
    g. Mounting locations for door hardware.
    h. List of related door devices specified in other Sections for each door and frame.

E. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer;
B. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
C. Field quality-control reports.
D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
B. Schedules: Final door hardware and keying schedule.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers,
    1. Scheduling Responsibility: Preparation of door hardware and keying schedule.

1.8 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 coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
C. Deliver keys to Owner’s Representative.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
    1. Failures include, but are not limited to, the following:
        a. Structural failures including excessive deflection, cracking, or breakage.
        b. Faulty operation of doors and door hardware.
        c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
   a. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of door hardware from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with The Massachusetts Architectural Access Board.
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
   2. Comply with the following maximum opening-force requirements:
      a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
      b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
   3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
   4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
   5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Allegion plc.
      b. Baldwin Hardware Corporation.
      c. McKinney Products Company; an ASSA ABLOY Group company.

2.4 MECHANICAL LOCKS AND LATCHES

A. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

B. Bored Locks: BHMA A156.2; Grade 2; Series 4000.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Allegion plc.
      b. Arrow USA; an ASSA ABLOY Group company.
      c. Corbin Russwin, Inc.; an ASSA ABLOY Group company.

C. Roller Latches: BHMA A156.16; Grade 1; rolling plunger that engages socket or catch, with adjustable roller projection.

D. Push-Pull Latches: Bored, BHMA A156.2; Series 4000; with paddle handles that retract latchbolt; capable of being mounted vertically or horizontally.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.

b. Allegion plc.
c. SARGENT Manufacturing Company; ASSA ABLOY.

2. Grade: 2.

2.5 AUXILIARY LOCKS

A. Bored Auxiliary Locks: BHMA A156.36: Grade 1; with strike that suits frame.

2.6 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Allegion plc.
b. ASSA, Inc.
c. SARGENT Manufacturing Company; ASSA ABLOY.
2. Finish: BHMA 626

B. Standard Lock Cylinders: BHMA A156.5; Grade 2 permanent cores; face finished to match lockset.
1. Core Type: Interchangeable.

C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.7 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
1. Existing system: Master key or grand master key locks to Owner's existing system.
2. Re-key Owner's existing master key system into new keying system.

B. Keys: Nickel silver or Brass.
1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
a. Notation: "DO NOT DUPLICATE."

2.8 OPERATING TRIM

A. Operating Trim: BHMA A156.6; aluminum unless otherwise indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Allegion plc.
b. Burns Manufacturing Incorporated.
c. Trimco.

2.9 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Allegion plc.
b. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
c. SARGENT Manufacturing Company; ASSA ABLOY.

2. Basis of Design:
   a. Sargent 1331 series Door Closer Finish: EN
   b. Corbin Russwin DC8000 series heavy duty door closer. Finish: BHMA689.

2.10 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Allegion plc.
      b. Architectural Builders Hardware Mfg., Inc.
      c. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
   2. Basis of Design:
      a. Floor: Rockwood 441.
      b. Wall: Rockwood 402.
   3. Finish: US26D.

2.11 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Hager Companies.
      b. National Guard Products, Inc.
      c. Pemko; an ASSA ABLOY Group Company.

B. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg, as follows:
   1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
   2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
   3. Gasketing on Double Doors: 0.50 cfm per foot of door opening.

2.12 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Hager Companies.
      b. National Guard Products, Inc.
      c. Pemko; an ASSA ABLOY Group Company.

2.13 POCKET DOOR HARDWARE

A. Soft close pocket door frame kit.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Johnson Hardware Inc.
      b. Schlage
      c. National Hardware
      d. Delaney Hardware
   2. Basis of Design: 100721SC Soft Close Pocket Door Hardware Kit, by Johnson Hardware, with:
      a. 200 lbs. maximum weight of door.
      b. 1503PK1 Bright brass edge pull.
      c. 2041PLBG Hidden pocket door guide kit.

2.14 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.
   1. Manufacturer's identification is permitted on rim of lock cylinders only.
B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
   1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
   2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
   3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.15 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
   1. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
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.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
1. Replace construction cores with permanent cores as directed by Owner.
2. Furnish permanent cores to Owner for installation.

E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 9200 "Joint Sealants."

F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
1. Do not notch perimeter gasketing to install other surface-applied hardware.

H. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

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. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.

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.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain door hardware.

3.8 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the Owner and Architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies,

conflicting hardware, and missing items should be brought to the attention of the Architect with corrections made prior to bidding. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products as listed in the door hardware sets. Quantities listed are for each pair of doors or for each single door.

C. Manufacturer's Abbreviations:
   1. JS – Johnson
   2. LW – Lockwood
   3. MK – McKinney
   4. RO – Rockwood
   5. SCH - Schlage

D. Hardware Schedule:

Set #1: Director's Office, Library Workroom, Storage (by Vault)

3 Hinges		US26D	SCH
1 Office/Entry Lock	Sparta	US26D	SCH
1 Cylinder		US26D	SCH
1 Wall Stop	RM861	US26D	RO
1 Strike Plate		US26D	
3 Silencers			

Set #2: Circulation Desk

1 Soft Close Pocket Door Hardware Kit		US26D	JS
1 Office/Entry Lock	7444SPDP	US26D	LW
1 Cylinder		US26D	SCH
1 Door Guide	Hidden door guide kit		JS

Note: Maximum door weight is 200 LBS. Coordinate with Section 08 1433 Stile and Rail Wood Doors.

END OF SECTION

SECTION 08 8000
GLAZING

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. Glass for interior windows.
   2. Glass for stile and rail doors.
B. Alternates: Not Applicable.
C. Items To Be Installed Only: Not Applicable.
D. Items To Be Furnished Only: Not Applicable.
E. Related Section:
   1. Section 08 1213 “Hollow Metal Frames”.
   2. Section 08 1433 “Stile and Rail Doors”.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
   1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
      a. 6 mm min.
C. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.
B. Samples: For the following products, in the form of 12-inch-square Samples for glass.
   1. Float glass for each designation indicated.
   2. Tempered glass for each designation indicated.
   3. Laminated glass for each designation indicated.
   4. For each color (except black) of exposed glazing sealant indicated.

C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
D. Qualification Data: For installers.
E. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
F. Product Test Reports: For each of the following types of glazing products:
   1. Glazing sealants.
   2. Glazing gaskets.
G. Sustainable Design Submittals:
   1. Manufacturers' product data for interior adhesives, sealants and sealant primers, including printed statement of VOC content.
H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance.
B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, tempered and laminated glass.
C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
D. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
   1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
   2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
E. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
   1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
   5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
F. Safety Glazing Products: Comply with testing requirements in 16 CFR 120.
   1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency] acceptable to authorities having jurisdiction.
   2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer's standard form, made out to the Owner and signed by laminated glass manufacturer agreeing to replace laminated glass that deteriorate by edge separation or other manufacturing defects, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LAMINATED GLASS FOR ACOUSTICALLY RATED ASSEMBLIES

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: 3/4 inch thickness min. laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
   2. Interlayer Thickness: 1.6 mm.
   3. Interlayer Color: Clear.

2.2 TEMPERED GLASS

A. Tempered Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind FT; 1/4 inch min.

2.3 CLEAR FLOAT GLASS

A. Clear Float Glass: ASTM C 1036; Type I (transparent flat glass); Class 1; Quality-Q3; 1/4 inch thick min.

2.4 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:
   1. Compatibility: Verify glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Colors of Exposed Glazing Sealants: As selected by Designer from manufacturer's full range.

4. Adhesives and sealants that are used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    a. Structural Glazing Adhesives: 100 g/L.
    b. Architectural Sealants: 250 g/L.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
    a. Dow Corning Corporation; 790.
    b. GE Silicones; SilPruf LM SCS2700.
    c. Tremco Inc.; Spectrem 1.

C. Glazing Sealants for Acoustically Rated Openings: Comply with ASTM C 834, ASTM E 90, ASTM C 919, and other requirements indicated for sealant specified, including those referencing classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single component, water based acrylic sealant:
    a. Pecora; AIS-919 or approved equal.

2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for project conditions.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Minimum required face or edge clearances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inchesas follows:
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inchminimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 CLEANING AND PROTECTION

A. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION

SECTION 09 2100
GYPSUM WALLBOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Non-structural metal framing for partitions, ceilings, soffits, furring, strapping and other conditions
   2. Gypsum wall board for partitions, ceilings, patching and other conditions as indicated
   3. Finishing of gypsum board surfaces

B. Items To Be Furnished Only:
   1. N/A.

C. Items To Be Installed Only:
   1. Division 07 Section "Building Insulation" for insulation in walls as indicated on drawings.
   2. Divisions 21, 22, 23 & 26 Sections for access panels furnished under those Sections.

D. Related Sections include the following:
   1. Division 06 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
   2. Division 09 Section ‘Acoustical Tile Ceilings’ for providing Drywall Grid System to which gypsum panels are attached.
   3. Division 09 Section ‘Interior Painting’ for primers and finish coats applied to gypsum board surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:
   1. Two 12 inch x 12 inch samples of each type of gypsum board specified and prepared for use.
   2. Two 12 inch length of each trim and accessory.

1.4 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 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.

1.6 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include but are not limited to, the following:

1. American Gypsum Company.
2. G-P Gypsum.
3. National Gypsum Company.
4. USG Corporation.
5. Dietrich Metal Framing

2.2 NON-LOAD-BEARING STEEL FRAMING

A. 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: Coating with equivalent corrosion resistance of ASTM A 653/A 653M**,** hot-dip galvanized, unless otherwise indicated.

B. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 24 gauge.
2. Depth: As indicated on Drawings or 3 5/8” minimum where not indicated.

C. Slip-Type Head Joints: Where partitions terminate at underside of structure, provide the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2 inch (50.8mm deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 24 gauge

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 24 gauge
2. Depth: 7/8 inch (22.2 mm)

F. Resilient Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 25 gauge
2. Depth: 7/8 inch (22.2 mm)

2.3 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or 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. American Gypsum Co.
   b. BPB America Inc.

c. G-P Gypsum.
d. National Gypsum Company.
e. USG Corporation.

B. For panels indicated as Gypsum Board:
1. ASTM C 1396 (section 5), regular type, 5/8” thickness
2. Long Edges: Tapered

C. For panels indicated to be moisture resistant: Gypsum panels with moisture and mold resistant core and surfaces.
1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

D. For panels indicated as Type X, Fire code, or in acoustic rated assemblies
1. ASTM C 1396 (section 5), Type X (Fire Code), 5/8” thickness
2. Long Edges: Tapered

2.4 CEMENTITIOUS BACKER UNITS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Custom Building Products; Wonderboard.
b. National Gypsum Company, Permabase Cement Board.
c. USG Corporation; DUROCK Cement Board.
2. Thickness: 1/2 inch.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.
B. Joint Tape: 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 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 all-purpose compound.
a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use all-purpose compound.
4. Finish Coat: For third coat, use all-purpose compound

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet
2. Shapes:
a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound..

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
B. Acoustical Sealant: Provide sealants that have a VOC content of 250g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, including existing adjacent surfaces for compliance with requirements and other conditions affecting performance.
B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF NON STRUCTURAL METAL FRAMING

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated for . Gypsum Board Assemblies: 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. Install studs so flanges within framing system point in same direction.
   1. Space studs 16 inches (406 mm unless otherwise indicated.
E. 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 door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb, unless otherwise indicated.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
F. Direct Furring: Screw to framing.
G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.3 APPLYING AND FINISHING PANELS

A. Comply with ASTM C 840.
B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
E. Form control and expansion joints with space between edges of adjoining gypsum panels.
F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

K. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 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. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges and where abutting surfaces with sealant joint

3.5 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 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 and according to ASTM C 840 for the designated areas.
1. Level 1 Finish: At joints and interior angles, embed the tape in the joint compound. Panel surfaces must be free of excess joint compound, but tool marks and ridges are acceptable:
   a. Ceiling plenums, chases and other concealed areas not requiring fire rating or as a smoke barrier
2. Level 2 Finish: At joints and interior angles, embed the tape in the joint compound and immediately apply the joint compound over the tape. Apply one coat of the joint

compound on fastener heads, and flanges of trim accessories. Panel surfaces must be free of excess joint compound, but tool marks and ridges are acceptable

a. Ceiling plenums, chases and other concealed areas requiring fire rating or as a smoke barrier
b. Mechanical rooms including boilers, air handler, electric services, fire protection rooms

3. Level 3 Finish: At joints and interior angles, embed the tape in the joint compound and immediately apply the joint compound over the tape. Apply one additional coat of the joint compound over the tape. Apply two separate coats of the joint compound over fastener heads and flanges of trim accessories. Panel surfaces and the joint compound must be smooth and free of tool marks and ridges
   a. Spaces for occupancy and not required to have a higher quality finish
4. Level 4 Finish: At joints and interior angles, embed the tape in the joint compound and immediately apply the joint compound over the tape. Apply two additional separate coats of the joint compound over flat joints. Apply one additional coat of the joint compound over interior angles. Apply three separate coats of the joint compound over fastener heads and flanges of trim accessories. Panel surfaces and the joint compound must be smooth and free of tool marks and ridges. "Drywall primer" must be applied to surfaces before applying final decoration
   a. Exposed surfaces entrances.

3.6 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, and 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.

END OF SECTION

SECTION 09 5123
ACOUSTICAL TILE CEILINGS
(FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS

A. Sub-bids shall be submitted in accordance with provisions of the Massachusetts General Laws, Chapter 149, Section 44A to 44L, inclusive, as amended. The time and place for submission of Sub-bids are set forth under the Advertisement. Procedures and requirements for submitting Sub-bids are set forth in the Instructions to Bidders.

B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a current DCAMM Sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.

C. Work to be done under this SECTION is shown on Contract Drawings numbered AD111, AD121, AD122, A151, A152, A501, and A502.

D. Remaining Contract Drawings are included for reference and coordination; Each Sub-bid filed with the Awarding Authority must be accompanied by BID BOND, CASH, or CERTIFIED CHECK, or a TREASURER'S CHECK or CASHIER'S CHECK, issued by a responsible bank or trust company, payable to the **Town of Boxford** in the amount stipulated in the INSTRUCTIONS TO BIDDERS. A Sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

E. Sub-subs: Sub-sub bids are not required for this Section. Paragraph E of the Form for Sub-bid shall be left blank or marked N/A.

F. Each Sub-bid submitted for the work, under this SECTION, shall be on a form furnished by the Awarding Authority, as required by SECTION 44F of Chapter 149 of the General Laws, as amended.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 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. Acoustical panels and exposed suspension systems for ceilings.
   2. Removal, salvage, and reinstallation of existing tile where shown on the Drawings.
   3. New suspension system for gypsum board ("Hard" ceiling).

B. Items To Be Installed Only: Not Applicable

C. Related Sections include the following:
   1. Divisions 21, 22, 23, and 26 for installation of building systems installed in ceilings.
   2. Division 21, 22, 23 and 26 for installation of building systems installed in ceilings.

1.4 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

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 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.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

A. Basis-of-Design Product: TBD, match existing.

1. Ecophon CertainTeed, Inc.
2. USG Interiors, Inc..
3. Armstrong Ceiling.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
2. Pattern: CE (perforated, small holes and lightly textured)

C. Color: White.

D. LR: Not less than 0.80.

E. NRC: Not less than 0.90.

F. Edge/Joint Detail: Square Tegular.

G. Thickness: 1 inch.

H. Modular Size: 24 by 24 inches or as indicated on Drawings.

I. Where existing ceilings are designated to remain and be altered, or extended, due to partition changes, provide new tiles as specified herein or alternative tiles selected to match existing.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's recommended direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. 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 3 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-inch-diameter wire.

2.4 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide ‘Prelude XL 15/16” Exposed Tee Grid System’ as manufactured by Armstrong, or a comparable product by one of the following:

1. Chicago Metallic Corporation.
2. USG Interiors, Inc.

B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 9/16-inch-wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted white.

C. Where required to match existing system, provide 15/16 or other grid as required to extend grid within specific designated rooms.

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.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
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. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
6. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

D. 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. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
   b. Install panels with pattern running in one direction parallel to short axis of space.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
5. 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.

E. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.
1. Install blankets to be continuous above ceilings, without gaps between adjacent blankets that will affect thermal performance.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 09 5123
ACOUSTICAL TILE CEILINGS
(FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS

A. Sub-bids shall be submitted in accordance with provisions of the Massachusetts General Laws, Chapter 149, Section 44A to 44L, inclusive, as amended. The time and place for submission of Sub-bids are set forth under the Advertisement. Procedures and requirements for submitting Sub-bids are set forth in the Instructions to Bidders.

B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a current DCAMM Sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.

C. Work to be done under this SECTION is shown on Contract Drawings numbered AD111, AD121, AD122, A151, A152, A501, and A502.

D. Remaining Contract Drawings are included for reference and coordination; Each Sub-bid filed with the Awarding Authority must be accompanied by BID BOND, CASH, or CERTIFIED CHECK, or a TREASURER'S CHECK or CASHIER'S CHECK, issued by a responsible bank or trust company, payable to the **Town of Boxford** in the amount stipulated in the INSTRUCTIONS TO BIDDERS. A Sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

E. Sub-subs: Sub-sub bids are not required for this Section. Paragraph E of the Form for Sub-bid shall be left blank or marked N/A.

F. Each Sub-bid submitted for the work, under this SECTION, shall be on a form furnished by the Awarding Authority, as required by SECTION 44F of Chapter 149 of the General Laws, as amended.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 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. Acoustical panels and exposed suspension systems for ceilings.
   2. Removal, salvage, and reinstallation of existing tile where shown on the Drawings.
   3. New suspension system for gypsum board ("Hard" ceiling).

B. Items To Be Installed Only: Not Applicable

C. Related Sections include the following:
   1. Divisions 21, 22, 23, and 26 for installation of building systems installed in ceilings.
   2. Division 21, 22, 23 and 26 for installation of building systems installed in ceilings.

1.4 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

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 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.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
   1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

A. Basis-of-Design Product: TBD, match existing.
   1. Ecophon CertainTeed, Inc.
   2. USG Interiors, Inc..
   3. Armstrong Ceiling.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
   1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
   2. Pattern: CE (perforated, small holes and lightly textured)

C. Color: White.

D. LR: Not less than 0.80.

E. NRC: Not less than 0.90.

F. Edge/Joint Detail: Square Tegular.

G. Thickness: 1 inch.

H. Modular Size: 24 by 24 inches or as indicated on Drawings.

I. Where existing ceilings are designated to remain and be altered, or extended, due to partition changes, provide new tiles as specified herein or alternative tiles selected to match existing.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's recommended direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. 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 3 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-inch-diameter wire.

2.4 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide ‘Prelude XL 15/16” Exposed Tee Grid System’ as manufactured by Armstrong, or a comparable product by one of the following:

1. Chicago Metallic Corporation.
2. USG Interiors, Inc.

B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 9/16-inch-wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted white.

C. Where required to match existing system, provide 15/16 or other grid as required to extend grid within specific designated rooms.

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.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
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. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
6. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

D. 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. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
   b. Install panels with pattern running in one direction parallel to short axis of space.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
5. 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.

E. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.
1. Install blankets to be continuous above ceilings, without gaps between adjacent blankets that will affect thermal performance.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 6513
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Description of work: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Resilient base on the first floor where partitions are affected and in all Library areas.
   2. Vinyl transition strips.
B. Items to be furnished only:
C. Items to be installed only: Not applicable.
D. Related Sections:
   1. Division 09 Section “Carpet” for carpeting.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples for Initial Selection: For each type of product indicated.
C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.
D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Furnish not less than 40 linear feet of each type, color, pattern, and size of resilient product installed.
   2. Provide 4 linear feet of each type of transition strip

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
B. Mockups: Provide resilient products with mockups specified in other Sections.

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.

1.7 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Armstrong World Industries, Inc.
b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
c. Endura Rubber Flooring; Division of Burke Industries, Inc.
d. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
e. Roppe Corporation, USA.
B. Resilient Base Standard: ASTM F 1861.
1. Material Requirement: Type TV (vinyl, thermoplastic)
2. Manufacturing Method: Group I (solid, homogeneous)
3. Style: Cove (base with toe.
C. Minimum Thickness: 0.125 inch.
D. Height: 4 inches.
E. Lengths: Coils in manufacturer's standard length.
F. Outside Corners: Field fabricated of same material.
G. Inside Corners: Coped.
H. Finish: Satin.
I. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 VINYL TRANSITION STRIPS

A. Provide Vinyl transition strips from the same manufacturer as vinyl base and accessories.
B. Provide transition strips as indicated on the drawings, and at transitions between resilient flooring and other flooring materials.

2.3 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
B. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. 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.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet, and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. 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.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION

SECTION 09 6813
TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Description of work: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Carpet tile flooring throughout the Library including the stacks, offices, workroom, and circulation desk.
   2. Carpet tile flooring at the first floor in the corridor and circulation desk queuing space.
   3. Flash patching of subfloor seams and imperfections ready for carpet installation.

B. Items to be furnished only: Furnish the following items for installation by the designated Sections: Not Applicable.

C. Items to be installed only: Install the following items as furnished by the designated Sections: Not Applicable.

D. Related Sections include the following:
   1. Division 09 Section “Resilient Base and Accessories” for base and transition strips.

1.3 SUBMITTALS

A. Product Data: For the following, including installation recommendations for each type of substrate:
   1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.

B. Shop Drawings: Show the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
   2. Carpet type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern type, repeat size, location, direction, and starting point.
   6. Pile direction.
   7. Type, color, and location of insets and borders.
   8. Type, color, and location of edge, transition, and other accessory strips.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet: 12-inch-square Sample.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
   3. Carpet Cushion: 6-inch-square Sample.
   4. Carpet Seam: 6-inch Sample.

D. Product Test Reports: For carpet for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet.

B. Warranty.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet: Not less than 25 whole tiles and one gallon of adhesive.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
B. Fire-Test-Response Ratings: Where indicated, provide carpet identical to those of assemblies tested for fire response per NFPA 253 by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.8 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, excess static discharge, and delamination.
   3. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE, GENERAL

A. Manufacturers include, but are not limited to:
   1. Mannington Mills, Inc.
   2. Tandus.
   3. Shaw Floors.
B. Type: Modular
C. Color: As Selected from manufacturer’s full range by Architect.
D. Dye Method: 100% Solution Dyed
E. Gauge: 5/64
F. Face Weight: 30 oz/sq yd
G. Fiber System: Manufacturer’s standard.
H. Stiches per inch: 9.4 stitches / inch
I. Construction: Stratatec Patterned Loop
J. Pile Height Average: 0.187 inch
K. Size Tiles: 24” x 24”

2.2 CARPET TILE, FIRST FLOOR CORRIDOR AND QUEUING SPACE

A. Basis of Design: Mannington “Self Assembly” “Continental” modular carpet tile, or approved equal.
B. Manufacturers include, but are not limited to:
   1. Mannington Mills, Inc.
   2. Tandus.

3. Shaw Floors.

C. Type: Modular
D. Color: As Selected from manufacturer's full range by Architect.
E. Face Weight: 33 oz/sq yd minimum.
F. Fiber: Type 6,6 Nylon.
G. Dye Method: Solution.
H. Construction: Patterned Loop
I. Backing: Jute, Polypropylene or Composite.
J. Size Tiles: Manufacturer's standard.

2.3 ADHESIVES

A. Provide a pressure sensitive roll on adhesive.
B. Basis of Design: Infinity 2 Carpet Tile Adhesive by Mannington.

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
B. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
   2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch , unless more stringent requirements are required by manufacturer's written instructions.
C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.
D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

A. Comply with CRI 104 and carpet manufacturers' written installation instructions.
B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
C. Do not bridge building expansion joints with carpet.

D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
G. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

3.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing carpet:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove yarns that protrude from carpet surface.
   3. Vacuum carpet using commercial machine with face-beater element.
B. Protect installed carpet to comply with CRI 104, Section 16, "Protecting Indoor Installations."
C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING
(FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS

A. Sub-bids shall be submitted in accordance with provisions of the Massachusetts General Laws, Chapter 149, Section 44A to 44L, inclusive, as amended. The time and place for submission of Sub-bids are set forth under the Advertisement. Procedures and requirements for submitting Sub-bids are set forth in the Instructions to Bidders.

B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a current DCAMM Sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.

C. Work to be done under this SECTION is shown on Contract Drawings numbered AD111, AD121, A111, A121, A131, A151, A152, A201, A300, A501, A502, A503, and A601.

D. Remaining Contract Drawings are included for reference and coordination; Each Sub-bid filed with the Awarding Authority must be accompanied by BID BOND, CASH, or CERTIFIED CHECK, or a TREASURER'S CHECK or CASHIER'S CHECK, issued by a responsible bank or trust company, payable to the **Town of Boxford** in the amount stipulated in the INSTRUCTIONS TO BIDDERS. A Sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

E. Sub-subs: Sub-sub bids are not required for this Section. Paragraph E of the Form for Sub-bid shall be left blank or marked N/A.

F. Each Sub-bid submitted for the work, under this SECTION, shall be on a form furnished by the Awarding Authority, as required by SECTION 44F of Chapter 149 of the General Laws, as amended.

1.2 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Description of work: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Examine the various trade sections of the Project Manual and be thoroughly familiar with all provisions regarding painting and finishing work included therein.
2. Refer to the Contract Drawings for various surfaces to be painted or finished.
3. Apply specified finish coats to all pre-primed work, and complete finishing system to all new unprimed work to be painted or finished.
4. Finishing coats of existing surfaces disrupted by the work of this Contract and are exposed to view in the finished Work.
5. Finishing coats of existing surfaces whether or not disturbed by the work of this section and shown on the drawings to be painted.
6. Clean and properly prepare, to receive paint and finishing materials, all items designated herein or on the Contract Documents to be painted or finished or remain exposed to view in finished project.
7. Finishing of all items indicated on the drawings as 'painted', 'PTD', '09 9123' or 'by 09 9123', or other similar references.
8. The following items do not require painting:
   a. Pre-finished items
   b. Prefinished aluminum, stainless steel, and surfaces of finished hardware.
   c. Piping, ductwork, conduits and similar items that are concealed in the finished Work.

d. Existing exposed structure and surfaces within the Attic except as otherwise indicated.
e. Glass, unless otherwise indicated.
f. Existing surfaces that are not disturbed by the Work of this Contract, unless indicated to ba painted.

B. Related Work: The following items of work are not included in this Section and are specified under the designated Sections.
1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 06 Section “Interior Finish Carpentry” for restoration of interior and exterior wood doors.
3. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
4. Division 09 Section "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.4 DEFINITIONS

A. Gloss is measured by a gloss meter from 60 degree angle from vertical, as a percentage of the amount of light that is reflected. The following terms are used to describe gloss:
1. Flat: Less than 5 units (Gloss Level 1 according to ASTM D 523)
2. Matte: 0 – 10 units (Gloss Level 2 according to ASTM D 523)
3. Eggshell: 10 – 25 units (Gloss Level 3 according to ASTM D 523)
4. Satin: 20 – 35 units (Gloss Level 4 according to ASTM D 523)
5. Semi-Gloss: 35 – 70 units (Gloss Level 5 according to ASTM D 523)
6. Gloss: 70 – 85 (Gloss Level 6 according to ASTM D 523)
7. High-Gloss: More than 85 units (Gloss Level 7 according to ASTM D 523)

1.5 SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
1. For paints and coatings, including printed statement of VOC content and MPI System number.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: Not less than 1 gal. of each material and color applied.

1.7 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. .
b. Other Items: Architect will designate items or areas required.
2. For third floor coffered ceiling, Architect will select one area 12’x12’ to include parts of each of the following surfaces: partition, moulding, and coffer for application of paint to review finish colors and sheen.
3. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F .

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Benjamin Moore & Co., or equal.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.

2. Nonflat Paints and Coatings: 150 g/L.

3. Primers, Sealers, and Undercoaters: 200 g/L.

4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.

D. Colors: As selected by Architect from manufacturer's full range.

2.3 PRIMERS

A. Metal: Primer, Rust-Inhibitive, Water Based: MPI #107

1. P04 BM Acrylic Metal Primer or approved equal.

B. Gypsum Board: Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149

1. N534 BM Ultra Spec 500 Primer Sealer or approved equal.

2.4 WATER-BASED PAINT

A. Gypsum Board: Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 2): MPI #144

1. Products: N537 BM Ultra Spec 500 Low Sheen Eggshell or approved equal

2. Up to a total of 4 wall colors may be selected

B. Metal: Latex, Interior, Semi-Gloss, (Gloss Level 5): MPI #54
   1. Products: V341 CoroTech Pre Cat Epoxy Semi-Gloss or approved equal
   2. Up to a total of 4 trim colors may be selected.

2.5 EPOXY COATINGS

A. Epoxy, Gloss: MPI #77.
B. Manufacturers of products that may be used include, but are not limited to the manufacturers listed below:
   1. Cloverdale Paint, Covacoat 300 High Build Epoxy Coating
   2. Sherwin Williams, Tile Clad HS Epoxy
   3. Comex Corporation, High Gloss Epoxy Coating
   4. PPG, Aquapon 35 Polyamide Epoxy Gloss
   5. Norco Paint & Coatings, Cleanpoxy (MPI 77)
C. Color: As selected by Architect from manufacturer's full range.

2.6 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
   1. Owner may engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Gypsum Board: 12 percent.
C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
E. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."
   3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
   4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed in equipment rooms:
      a. Equipment, including panelboards.
   2. Paint the following work where exposed in occupied spaces:
      a. Other items as directed by Architect.
   3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 EPOXY COATING PREPARATION AND APPLICATION

A. Apply epoxy coating according to manufacturer’s written instructions in areas as indicated on drawings.

3.5 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 INTERIOR PAINTING SCHEDULE FOR **NEW SURFACES AND MATERIALS**

A. Metal Substrates:
   1. Base Coat: Primer
   2. Intermediate Coat: Water-Based Paint
   3. Top Coat: Water-Based Paint

3.8 INTERIOR PAINTING SCHEDULE FOR **EXISTING PAINTED SURFACES OR PRE-PRIMED MATERIALS**

A. Gypsum Board Substrates:
   1. Base Coat: Spot prime if needed.
   2. Intermediate Coat: Water-Based Paint
   3. Top Coat: Water-Based Paint
B. Metal Substrates:
   1. Base Coat: Spot prime if needed.
   2. Intermediate Coat: Water-Based Paint
   3. Top Coat: Water-Based Paint

END OF SECTION

SECTION 09 9300

STAINING AND TRANSPARENT FINISHING

(Part of the work of Section 09 9123 – INTERIOR PAINTING, Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Description of work: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Surface preparation and application of wood finishes on the following substrates:
      a. Wood trim designated to receive transparent finish.
      b. New and existing wood doors, trim and sidelites designated to receive transparent finish.

B. Related Requirements:
   1. Division 06 Section “Interior Finish Carpentry” for wood trim and restored doors to receive stains and transparent finishes, including providing wood samples for the production of finishing samples.
   2. Division 8 Sections Wood Flush Doors and Stile and Rail Wood Doors for furnishing doors to be finished under this Section and providing flitches to for production of finishing samples.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

D. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.
   1. Submit Samples on representative samples of actual wood substrates as indicated in related sections.
   2. Label each Sample for location and application area.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Stains and Transparent Finishes: Not less than 1 quart in new unopened containers of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
   a. Provide mock-up of one interior door face of each new and existing units as directed by Architect.
2. Final approval of stain color selections will be based on mockups.
   a. If preliminary stain color selections are not approved, provide additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.
B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Benjamin Moore & Co., or equal.

2.2 MATERIALS, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
B. Material Compatibility:
   1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.
C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior stains and finishes applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   1. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
   2. Stains: VOC not more than 250 g/L.
   3. Primers, Sealers, and Undercoaters: 200 g/L.
D. Stain Colors: As selected by Architect from manufacturer's full range.
E. Transparent Finish:
   1. Grade: Premium.
   2. Finish: AWI conversion varnish or AWI catalyzed polyurethane system.
   3. Staining: As selected by Architect from manufacturer's full range.
   4. Effect: Open-grain finish.
   5. Sheen: Satin.

2.3 WOOD FILLERS

A. Paste, Grain Filler: MPI #91.
   1. Benjamin Moore, Benwood Wood Grain Filler 238.

2.4 STAINS

A. Stain, Semi-Transparent, for Interior Wood: MPI #90.
   1. Benjamin Moore, Benwood Interior Penetrating Stain C234.

2.5 POLYURETHANE VARNISHES

A. Varnish, Water Based, Clear, Semi-Gloss (Gloss Level 4): MPI #129.
   1. Benjamin Moore, Benwood Stays Clear Acrylic Polyurethane Low Luster 423.

2.6 SOURCE QUALITY CONTROL

A. Testing of Materials: Owner reserves the right to invoke the following procedure:
   1. Owner may engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Maximum Moisture Content of Interior Wood Substrates: 13 percent, when measured with an electronic moisture meter.
C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes, fillers and conditioners.
D. Proceed with finish application only after unsatisfactory conditions have been corrected.
   1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
   1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
   2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
D. Interior Wood Substrates:
   1. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.

2. Sand surfaces that will be exposed to view and dust off.
3. Apply clear conditioner coat. Sand smooth when dried.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for finish and substrate indicated.
   2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
   3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood substrates, non-traffic surfaces, including wood trim, architectural woodwork and wood doors.
   1. Transparent finish system:
      a. Substrate Preparation: Benwood Wood Grain Filler 238.
      b. First Coat: Benwood Waterborne Stain/Wood Conditioner (Clear) 205.
      c. Second Coat: Benwood Interior Wood Penetrating Stain C234.
      d. Third, Fourth and Fifth Coats: Benwood Stays Clear Acrylic Polyurethane Low Luster 423.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Dimensional characters at main circulation desk.
   2. Removal, salvage and reinstallation of dimensional characters.
B. Items To Be Furnished Only: Not Applicable.
C. Items To Be Installed Only: Not Applicable.
D. Related Sections include the following:
   1. Not Applicable.

1.3 SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: For dimensional letter signs.
   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   3. Show message list, typestyles, graphic elements, and layout for each sign.
C. Samples: For each type of sign assembly, exposed component, and exposed finish.
   1. Include representative Samples of available typestyles and graphic symbols.
   2. One letter in each size of dimensional character.
D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.
E. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by sign fabricator.
B. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and MAAB.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of finishes beyond normal weathering.
      b. Separation or delamination of sheet materials and components.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Sign:

1. Fabricated Stainless Steel Metal Letters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
2. Basis-of-Design Product: Subject to compliance with requirements, provide fabricated metal lettering provided by Gemini Ltd.
3. Character Material: Metal faced fabricated stainless steel, no back
4. Character Height: As shown on Drawings.
5. Thickness: 1 inch
6. Finishes: Brushed: As selected by Architect from manufacturer's full range.
7. Mounting: Surface mounted.
8. Typeface: Match existing.

2.2 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
   1. Sign Mounting Fasteners for dimensional characters:
      a. Gemini Standard Mounting for Fabricated Stainless Steel: 2A-Stud Mount
      b. Gemini Mounting for Minnesota Letters: 1A-Plain Mount

2.3 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
   1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
   2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
   3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
   4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
   5. Internally brace signs for stability and for securing fasteners.
   6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
   7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

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 signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Projecting Studs for dimensional characters and panel signs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
   a. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

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SECTION 12 3623.13
PLASTIC LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 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. Plastic laminate-clad countertops at circulation desk, both the main desk, transaction counter, and built-in desk at the back of the area.
   2. Plastic laminate-clad countertop and backsplash removal and installation in the Break Room on the first floor.

B. Items To Be Installed Only: Not Applicable.

C. Items To Be Furnished Only: Not Applicable.

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 06 1000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
   2. Section 06 2023 "Interior Finish Carpentry" for interior carpentry items
   3. Section 06 4116 “Plastic Laminate Faced Architectural Cabinets” for cabinets to receive countertops.
   4. Section 07 9200 “Joint Sealants” for sealants.

1.3 DEFINITIONS

A. “P.Lam.” denotes Plastic Laminate.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples:
   1. For each type of product indicated.
      a. Manufacturer’s full range of color samples for selection.
      b. Submit minimum 6-inch by 6-inch sample in specified gloss of selected material.
      c. Cut sample and seam together for representation of inconspicuous seam.
      d. Indicate full range of color and pattern variation.
   2. Approved samples will be retained as a standard for work.

C. Product certificates:
   1. For type of product, signed by product manufacturer.

D. Fabricator/installer qualifications:
   1. Provide copy of certification number.

E. Manufacturer certificates:
   1. Signed by manufacturers certifying that they comply with requirements.

F. Maintenance data:
   1. Submit manufacturer’s care and maintenance data, including repair and cleaning instructions
      a. Maintenance kit for finishes shall be provided to Owner.
   2. Include in project closeout documents.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Shop that employs skilled workers who custom fabricates products similar to those required for this project and whose products have a record of successful in-service performance.

B. Fabricator/installer qualifications:
   1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.

C. Applicable standards:
   1. Standards of the following, as referenced herein:
      a. American National Standards Institute (ANSI)
      b. American Society for Testing and Materials (ASTM)
      c. National Electrical Manufacturers Association (NEMA)
      d. NSF International
   2. Fire test response characteristics:
      a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
         1) Flame Spread Index: 25 or less.
         2) Smoke Developed Index: 450 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver no components to project site until areas are ready for installation.
B. Store components indoors prior to installation.
C. Handle materials to prevent damage to finished surfaces.
   1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
B. Do not install materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.8 WARRANTY

A. Provide manufacturer's warranty against defects in materials.
   1. Warranty shall provide material and labor to repair or replace defective materials.
   2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
B. Optional Installed Warranty:
   1. To qualify for the optional Installed Warranty, fabrication and installation must be performed by a DuPont Certified Fabrication/Installation source who will provide a brand plate for the application.
   2. This warranty covers all fabrication and installation performed by the certified/approved source subject to the specific wording contained in the Installed Warranty Card.
C. Manufacturer's warranty period:
   1. Ten years from date of substantial completion.

1.9 MAINTENANCE

A. Provide maintenance requirements as specified by the manufacturer.

PART 2 - PRODUCTS

2.1 ACCESSORIES

A. Joint adhesive:
   1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant:
   1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone any type), UL-listed silicone sealant in colors matching components.

C. Conductive tape:
   1. Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

D. Insulating felt tape:
   1. Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.2 PLASTIC-LAMINATE COUNTERTOPS

A. General: existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
   1. Provide metal brackets on wood cleats fastened through finish into wood blocking at 30" o.c..
   2. Provide product in the largest pieces available.
   3. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
      a. Exposed solid surfacing joints/seams shall not be allowed.
      b. No exposed seams in P. Lam. counters.
   4. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
   5. Cut and finish component edges with clean, sharp returns.
   6. Rout radii and contours to template.
   7. Anchor securely to base cabinets or other supports.
   8. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
   9. Carefully dress joints smooth, remove surface scratches and clean entire surface.
   10. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.

B. Coved backsplashes and applied sidesplashes:
   1. Install applied backsplashes and sidesplashes where applicable using manufacturer's standard color-matched silicone sealant.
   2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

3.3 REPAIR

A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

3.4 CLEANING AND PROTECTION

A. Keep components clean during installation.
B. Remove adhesives, sealants and other stains.

END OF SECTION

SECTION 21 00 00
FIRE PROTECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The existing building is protected with a wet pipe sprinkler system fed by a cistern and a fire pump. There will be no change in occupancy use group or hazard classification as part of this project. Hydraulic calculations should not be required for the proposed scope of work.

B. Provide modifications to the existing automatic fire protection system for the Boxford Library and Town Hall Building as indicated on the plans, including, but not limited to piping, sprinkler heads, hangers and testing.

C. Provide testing and flushing of the existing system on the first and second floors from the alarm valve to the most remote interior connection on the first floor. Testing shall conform to NFPA-25, 2020ed. Video record all flushing tests and interior inspections. Provide test results and recommendations to the owner and Engineer.

D. Provide new sprinkler heads and piping to accommodate the new architectural and ceiling layout.

E. Provide pipe marking.

F. Provide spare sprinkler heads in accordance with NFPA-13.

G. Perform testing of new work in accordance with NFPA-13.

H. Provide operating and maintenance manuals.

I. Provide guarantees.

J. Provide shop drawings and record drawings of actual installation.

K. Provide cleaning and rubbish removal for trade related items.

L. Disconnect and reinstallation of fire protection equipment temporarily interrupted during construction.

M. Provide necessary supervision and coordination information to any other trades involved in the construction, to accommodate space, support or service requirements for equipment and piping provided under this section of the specifications.

N. Provide shop drawings relative to fire protection systems as follows: Before buying or installing any fire protection equipment, prepare and submit shop drawings of equipment and piping, to scale, of fire protection systems piping to the Engineer.

O. Provide all required fire watches while the system is impaired. Coordinate with the owner and the Boxford Fire Department.

P. Coordinate all system shut downs with the owner and the Boxford Fire Department.

Q. Review all Civil, Structural, Plumbing, HVAC, Electrical, and Architectural drawings and visit site prior to submission of bid to familiarize self with conditions and scope of construction.

R. Coordinate, with Electrical contractor, the installation and compatibility of all flow, tamper, pressure and alarm devices, required and specified, for the proper annunciation and transmission of an alarm or trouble condition to the local Fire Department or monitoring agency.

S. All Fire Protection work from the Property line to the last outlet in the interior system shall be installed by a sprinkler fitter licensed in the state of Massachusetts.

T. Install firestopping at all penetrations where work of this section penetrates fore-rated assemblies. Fire stopping to be furnished by GC under section 078413 – Penetration Firestopping.

U. Furnish access panels for the work of this section to the trade in which the panel is to be located.

V. All staging, exterior and interior, required to be over eight feet in height, shall be furnished and erected by the General Contractor and maintained in safe condition by him without charge to and for the use of all trades as needed by them for proper execution of their work, except where specified to the contrary in any filed sub-bid Section of the Specification.

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.

W. Any staging that is up to eight (8) feet in height shall be furnished and erected by the applicable Subcontractor.

1.02 CODES, PERMITS AND FEES

A. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, but not limited to:

1. All Applicable NFPA Standards
2. 780 CMR Massachusetts State Building Code Ninth Ed.
3. American Society of Mechanical Engineers
4. American Society of Testing and Materials
5. American National Standards Institute
6. Underwriters' Laboratories, Inc.
7. Occupational Safety and Health Administration
8. Massachusetts Department of Environmental Protection
9. Local Fire Department
10. Local Water Department
11. American Water Works Association
12. FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)
    i) FM P7825 (Supplement I, II & III) Approval Guide
13. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
    ii) MSS SP-71 Cast Iron Swing Check Valves, Flanges and Threaded Ends
    iii) MSS SP-58 Pipe Hangers and Supports – Materials, Design and Manufacture
    iv) MSS SP-69 Pipe Hangers and Supports, Selection and Application
14. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
    v) NFPA -13 (2013) Standard for the Installation of Sprinkler Systems
    vi) NFPA -25 (2020) Inspection, Testing, and Maintenance of Water Based Fire protection Systems
15. UNDERWRITERS LABORATORIES (UL)
    vii) UL-01 (1994) Building Materials Directory
    viii) UL-04 (1994); Fire Protection Equipment Directory

ix) UL 668 (1989) Hose Valves For Fire Protection Service

B. Under this section of the specification, pay all fees, submit all necessary documents, obtain all permits, certificates and necessary approvals from authorities having jurisdiction, for work under this specification, prior to installation. All costs for these requirements shall be borne under this section of the specification.

1.03 CUTTING, CORING AND PATCHING

A. Cutting and patching through existing or new construction using core drill and measuring larger than 6 inches in diameter, or 6 inches by 6 inches shall be performed by Trades specializing in the specific surfaces affected, e.g., carpentry, masonry, metals, etc., except where noted otherwise. Notify the specific Trade(s) of exact locations and sizes for openings required.

1. Exposed concrete coring: Notify Contractor of exact locations and sizes for all openings required in exposed concrete, to be executed under Section 03 3000 – Cast-in-Place Concrete.
2. Concrete coring less than 6 inches: Any new penetration cut through existing concrete less than 6 inches in width shall be executed by this SECTION.
3. Concrete coring 6 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 6 inches in diameter required in concrete, to be executed under Section 03 3000 – Cast-in-Place Concrete.
4. Masonry openings less than 6 inches: Any new penetration cut through existing masonry less than 6 inches in width shall be executed by this SECTION.
5. Masonry openings 6 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 6 inches in width required in masonry, to be executed under Section 04 2113 – Brick Masonry, utilizing lintels, furnished per Section 05 5000 – Miscellaneous Metals.
6. Exposed gypsum board: Notify Contractor of exact locations and sizes for all openings required in exposed gypsum board, to be executed under Section 09 2900 – Gypsum Board Assemblies.
7. Concealed gypsum board: Any new penetration cut through existing or new concealed gypsum board less than 6 inches in width shall be executed by this SECTION. Cutting and patching larger than 6 inches in diameter, or 6 inches by 6 inches to be executed under Section 09 2900 – Gypsum Board Assemblies.
8. All cutting shall conform to the requirements of Section 01 7300 – Execution, and 02 4119 – Demolition. Notify Architect prior to any cutting or coring larger than 2 inches.

1.04 SHOP DRAWINGS

A. Shop drawings shall be submitted in accordance with requirements set forth by the architect/owner.

B. This contractor shall assume the associated cost of and entire responsibility for coordination with all the trades involved for any items of material or equipment substituted for those specified or shown. Such changes shall not be a matter for subsequent change order for extra work to the contract.

C. List of Shop Drawings:

1. Piping, Fittings and Accessories
2. Valves
3. Gauges
4. Flow switches, monitoring switches and alarms
5. Sprinkler heads and layouts
6. Fire Stopping, Sleeves and escutcheons

1.05 DRAWINGS, SPECIFICATIONS AND COORDINATION

A. It is the intention of Contract Documents to call for complete, finished work, fully tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the drawings by mention in the specifications, or vice versa, or incidental accessories necessary to make work complete and acceptable in all respects and ready for operation shall be furnished, delivered and installed under this Section of the Specifications without additional expense to the Owner.

B. Drawings are generally diagrammatic and are intended to convey scope of work and indicated general arrangements of equipment, piping, and fixtures. Exact location to be determined in the field.

C. Manufacturers catalog numbers specified herein are intended only as a guide to type and quality to be provided by this contractor.

D. Follow drawings in layout work, check drawings of, and coordinate with, other trades to verify special provisions, installation requirements and spaces in which work provided under this Section of the Specifications will be installed. Maintain maximum headroom or space conditions at all points. Where headroom or space conditions appear inadequate, notify the Architect/Owner before proceeding.

E. Maintain a clean, dry, legible and current record drawing.

F. Where, due to Union regulations or Trade Agreements, any of the work shown on the Drawings or specified herein is considered work of other trades, the work in question shall be subcontracted as a part of this Section of the Specifications and responsibility for the complete installation shall be included in this Section of the Specifications.

1.06 INSPECTION OF SITE CONDITIONS

A. Prior to submission of bid, the Trade Contractor shall visit the site and/or review the related construction documents to determine the conditions under which the work is to be performed, and familiarize himself with existing conditions. He shall report in writing to the Architect/Owner any conditions which may adversely affect the Contractor's work.

1.07 WARRANTIES

A. All materials, types of equipment and workmanship furnished under this section shall carry standard warranty against all defects in material and workmanship for a period of not less than one (1) year from date of acceptance by Owner.

1.08 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Deliver to the designated representative of the Owner, through the Engineer, five complete sets of operating, service and replacement data for all equipment which will require operating maintenance or replacement and make one copy of this literature available during the instruction of the operating personnel while the other is checked for completeness by the Engineer.

B. Operating manual: upon completing the work, provide the Engineer with five copies of the approved operating manual containing approved shop drawings, and details, and typewritten instruction relative to the care and operation of the equipment, all properly indexed and bound in hard back, three ring binders. The manual shall have the following contents:

1. Introduction:
    a) Explanation of Manual and its use
    b) Address and telephone number of this contractor
2. Shop drawings and required calculations for all systems.
3. Maintenance:
    a) Recommended List of Spare Parts: Furnish typed set of instructions for ordering spare parts with sectional views of the fittings or equipment showing parts numbered or labeled to facilitate ordering replacements. Each set shall include a list with itemized prices of those parts recommended to be kept on hand as spares, as well as the name and address of where they may be obtained.

b) Maintenance Data for each type sprinkler head, valve, piping specialty and fire protection specialty.
c) Dimensional drawings for all equipment

4. Manufacturer's Literature:

a) Sprinkler Heads
b) Piping and Appurtenances

5. Testing procedures for each system including frequency. **Include a current copy of NFPA-25**.

6. Written Guarantee: Refer to Paragraph "Warranties".

1.09 COORDINATION DRAWINGS

A. The HVAC Subcontractor, the Plumbing Subcontractor, the Electrical Subcontractor and the Fire Protection Contractor shall coordinate all HVAC, plumbing, electrical and sprinkler work with that of each trade, in order to:

1. Avoid interferences between general construction, mechanical, electrical, structural and other specialty trades.
2. Maintain clearances and advise other trades of clearance requirements for operation, repair, removal and testing of equipment.
3. Indicate aisleways and accessways required on coordinated shop drawings for mechanical equipment rooms, electrical rooms, computer rooms, and kitchens.
4. Coordinate location of sleeves and inserts, including setting in place prior to pouring concrete.

B. Subcontractor’s Coordination Drawings

1. This Subcontractor for the work of this SECTION shall prepare Coordination Drawings showing all the work of this Section to be installed. The Coordination Drawings shall be not less than 1/4 inch scale for MEP spaces and not less than 1/8 inch scale for other areas. Coordination drawings shall be produced in digital (CAD) files as required by Section 01 3100 “Project Management and Coordination.” The coordination drawings shall be initiated by the HVAC Subcontractor and then forwarded to the Fire Protection Subcontractor.
2. The Fire Protection Subcontractor, after showing all of the Fire Protection work, shall forward the reproducible coordination drawings to the Plumbing Subcontractor.
3. The Plumbing Subcontractor, after showing all of the Plumbing work, shall forward the reproducible coordination drawings to the Electrical Subcontractor.
4. The sequence of Coordination Drawings shall be HVAC Subcontractor to Plumbing/Fire Protection Subcontractor to Electrical Subcontractor to General Contractor.
5. The Subcontractor for the work of this SECTION shall attend a series of meetings arranged by the Contractor to resolve any real or apparent interferences or conflicts with the work of the other contractors or with ceiling heights shown on the drawings.
6. The Subcontractor for the work of this SECTION shall then make adjustments to his work on the Coordination Drawings to resolve any real or apparent interferences or conflicts.
7. After any real or apparent interferences and conflicts have been incorporated into the Coordination Drawings, the Contractor shall prepare the final Coordination Drawings and submit to the Construction Manager.
8. The Subcontractor for the work of this SECTION shall not install any of his work prior to the preparation of the final Coordination Drawings. If the work of this SECTION proceeds prior to the final Coordination Drawings, any change to the work to correct the interferences and conflicts which result will be made by the Subcontractor for the work of this SECTION at no additional cost to the Owner.
9. Coordination Drawings are for the Subcontractor's and Architect’s use during construction and shall not be construed as replacing any shop, "as-built", or Record Drawings required elsewhere in these Contract Documents.
10. Architect’s review of Coordination Drawings shall not relieve the Subcontractor for the work of this SECTION from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

1.10 COOPERATION AND COORDINATION WITH OTHER TRADES

C. The work shall be so performed that the progress of the entire building construction including all other trades, shall not be delayed nor 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 desired.

D. 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/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 Architect's/Engineer's satisfaction, at no expense to the Owner.

E. 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. Prepare and submit for approval 3/8 inch scale or larger working drawings and sections, clearly showing how this work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

F. 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.

G. All distribution systems which require pitch or slope such as sanitary drains and water piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.

H. Where there is evidence that work of this Subcontractor will interfere with the work of other trades, this Subcontractor shall assist in working out space conditions to make satisfactory adjustments.

I. This Subcontractor shall, with the approval of the Engineer and without extra charge, make reasonable modifications in his work as required by structural interference's, or by interference with work of other trades, or for proper execution of the work.

J. If this Subcontractor installs his work before coordinating with other trades and his work causes interference with the work of such other trades, he shall make all necessary changes in his work to correct the condition without extra charge and as directed by the Engineer.

K. 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.

PART 2 PRODUCTS

2.01 PIPE, FITTINGS AND JOINTS

A. Pipe and fittings shall conform to the latest ANSI, ASTM, NFPA and AWWA Standards including latest amendments.

B. Fire Protection Water Piping - Wet Systems

1. Sprinkler cross mains and branches 2” and larger may be light wall black steel pipe with rolled groove type malleable iron pipe couplings and fittings with gaskets and bolts as approved by the National Fire Protection Association and the Underwriters' Laboratories. Schedule 40 black steel pipe with standard weight malleable iron fittings as approved by NFPA and UL may be used with, or in lieu of, the system described above for cross mains and branch lines.

2. Sprinkler branches 1½” and smaller shall be schedule 40 black steel pipe with standard weight malleable iron fittings as approved by NFPA and UL.

2.02 HANGERS AND SUPPORTS

A. Hangers and sway bracing where required, shall be installed to meet NFPA-13, 2013 compliance as to location, spacing, and maximum loads.

B. Hanger material shall be compatible with piping materials with which it comes into contact.

C. Hangers shall be installed, in addition to the above, at all changes of direction (horizontal and vertical), valves and equipment connections. Hangers shall be located so that their removal is not required to service, assemble or remove equipment.

D. Horizontal runs may use band hangers up to 4" size. Piping larger than 4" shall be provided with clevis type.

E. Vertical support shall be by means of riser clamps (anchors with split ring type allowable up to 2" size only) and adjustable pipe support with flange anchored to floor.

F. All rods, clamps, nuts, washers, shields and hangers in all areas shall be electro-galvanized coated steel.

G. Valve and piping supports, from the floor, shall be adjustable pipe support and complete with pipe standard and flange, anchored to floor. Supports shall be installed at each control valve, riser tee or elbow and where any un-supported section located up to 4’-0” above finished floor, exceeds 4'-0" in length measured along piping centerline. Where piping and valves are supported vertically from a Uni-Strut type framework in conjunction with riser clamps installed in the horizontal position the minimum rod sizing shall be the same as for vertically hung piping.

2.03 VALVES AND SUNDRIES

A. General

1. Shutoff valves on the aboveground Fire Protection System shall be UL, FM Butterfly or OS&Y gate valves, as indicated, on sizes 2-1/2" and larger, valves up to 2" shall be UL, FM Ball Valves. All isolation / Control valves shall be monitored.

2. Check valves shall be 175-pound class for Fire Protection.

3. Valves shall be provided with seats suitable for the service intended.

B. Sprinkler system valves

1. Valves shall be as manufactured by Nicbo, Victaulic, Wallworth, Milwaukee or approved equal. Manufacturers model numbers referenced below are used to indicate a type, material and quality to be provided.

2. All valves specified herein shall be UL/FM approved, 175 PSI minimum working pressure. All control valves shall be provided with tamper switch.

2.04 SLEEVES AND ESCUTCHEONS

A. All pipes passing through floors, walls, foundations or partitions shall be provided with sleeves having an internal diameter with a minimum of one inch larger than the outside diameter of the pipe.

B. Sleeves through outside walls, foundations, and slab on grade shall be Schedule 40 black steel pipe with a 150 pound black steel slip on welding flanges, welded at the center of the sleeve and shall be painted with one coat of bitumastic paint, inside and outside. Patch around sleeves with hydraulic cement where necessary to maintain a waterproof seal.

C. Sleeves through interior masonry floors and walls shall be Schedule 40, black, steel pipe. Sleeves through interior non-masonry walls or partitions shall be 22 gauge galvanized sheet steel.

D. The sleeves through outside walls and slab on grade shall be provided with pipe to wall penetration closures. Seals shall be mechanical type of interlocking rubber links shaped to fill space between pipe and sleeve. Links shall be assembled with bolts to form a belt around the pipe with pressure plate under each bolt head and nut. After seal assembly is positioned, tightening of bolts will provide watertight seal. This Contractor shall determine the required inside diameter of each individual sleeve before ordering, fabricating or installing. The inside diameter of each sleeve shall be sized as recommended by the manufacturer to fit the pipe to assure a watertight joint.

E. Sleeves through walls shall terminate flush with face of wall. Sleeves through floor shall terminate 1" above finished floor.

F. Required fire resistance of floors and walls shall be maintained where penetrations occur. Caulk the space between the pipe and sleeve with fire rated caulking (3M, Johns Manville, Hilti or equal) installed per manufacturers recommendations to a depth as required to maintain the rating of the floor, wall or partition..

G. Escutcheons shall be provided with a set screw to properly hold escutcheon in place and shall be provided at all exposed floor, ceiling and wall penetrations in finished areas. Floor penetrations, which require a riser clamp above or below the floor, shall be exempt from the escutcheon requirement on the clamp side.

2.05 AUTOMATIC SPRINKLERS

A. Sprinkler Heads: quick response, bulb type, and style as indicated or required by the application. Unless otherwise indicated, provide heads with nominal 1/2 inch discharge orifice (K=5.6 or greater) and a temperature rating of 155°F. The finishes of all sprinkler heads, cover plates and escutcheons shall be coordinated with the Architect. Acceptable manufacturers include Tyco, Reliable and Viking.

B. In all open areas, where electrical equipment is located, an approved type shield, to keep water off the electrical equipment, shall be provided.

C. Provide in the existing sprinkler cabinet, spare sprinkler heads plus sprinkler head wrenches per NFPA-13.

2.06 SPRINKLER SHOP DRAWINGS

A. Contractor shall provide shop drawings, for approval, of entire first floor.

2.07 PIPE IDENTIFICATION AND VALVE TAGS

A. All piping, except that piping which is within inaccessible chases, shall be identified with semi-rigid plastic identification markers equal to Seton Setmark pipe markers. Direction of flow arrows are to be included on each marker. Each marker background shall be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the “Scheme for the Identification of Piping Systems” (ANSI A13.1-1981). Setmark snap-around markers shall be used for overall diameters up to six (6) inches and strap-around markers shall be used above six (6) inch overall diameter. Markers shall be located adjacent to each valve, at each branch, at each cap for future, at each riser take off, at each pipe passage through wall, at each pipe passage through floors, at each pipe passage to underground and on all vertical and horizontal piping at 20 foot intervals

maximum.

2.08 ACCESS PANELS

A. ACCESS DOORS AND FRAMES

1. Furnish access doors and frames for access to all concealed parts of the systems of this Section that require accessibility for the proper operation, maintenance and inspection of the system.
2. All Access Doors shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that the accessible components of the systems of this Section can be easily reached, and the size shall be sufficient for this purpose. When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.
3. Provide access door to match rating of the assembly into which it is installed.
4. Access doors shall be prime painted and equipped with screwdriver operated cam locks.
5. Access doors and frames shall be furnished by this SECTION to the General Contract for installation by the SECTION installing the construction into which the panel is located.
6. Access doors and frames shall comply with the requirements of Section 08 3113 “Access Doors and Frames”

B. Size shall be sufficient for the purpose, but no less than 12 inches by 18 inches. Particular attention shall be exercised in the selection of doors for masonry walls in order that frame sizes used will match the courses of brick or block.

C. Access doors shall be prime coated of rust inhibitive paint, continuous hinge and manufactured by Inland Steel Products Company “Milcor”, Miami-Carey or Walsh-Hannon-Gladwin, Incorporated “Way Loctor”. Type shall be based upon “Milcor” as follows:

D. Suspended Drywall Ceilings: Style ATR with 16 gauge frame, 18 gauge panel and flush screwdriver operated cam locks.

E. Plastered Walls and Ceilings: Style K with 16 gauge frame, 14 gauge panel and flush screwdriver operated cam locks.

F. Non-Rated Drywall Walls: Style DW with 16 gauge frame, 14 gauge panel and flush screwdriver operated cam locks.

G. Point out to the GC exactly which tile units are to be marked with a colored button to indicate equipment above.

2.09 FIRESTOPPING

A. Firestopping shall be furnished and installed by this section wherever the work of this section penetrates fire-rated assemblies.

B. Firestopping by this section shall comply with the requirements of section PENETRATION FIRESTOPPING..

PART 3 EXECUTION

3.01 INSTALLATION

A. Install piping approximately as shown on the drawings, piping shown on the drawings is diagrammatic only and exact location shall be determined in the field.

B. Review all architectural, structural, HVAC, electrical and site drawings before starting work to familiarize oneself with the details of construction in addition to coordinating with other trades to eliminate possible conflicts.

C. Piping shall be installed straight and direct as possible, forming right angles or running parallel to walls, structural items and other piping.

3.02 FLUSHING AND TESTING OF NEW & EXISTING SYSTEMS

A. General

1. All labor, materials, instruments, devices and power required for testing shall be provided by this Contractor. The tests shall be performed in the presence and to the satisfaction of the Engineer, General Contractor and the Local Fire Department and such other parties, as may have legal jurisdiction. No piping in any location shall be closed up, furred in, or covered before testing.
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 the General Contractor shall be re tested in part or in whole as directed.
4. The Engineer retains the right to request a recheck or resetting of any pump or instrument by this contractor during the guarantee period at no additional cost to the Contractor.
5. Repair, or if directed, replace any defective work with new work without extra charge to the Contract. Repeat tests as directed, until the work is proven to meet the requirements specified herein.
6. Restore to its finished condition any work, damaged or disturbed, provided by other contractors and engage the original contractor to do the work of restoration to the damaged or disturbed work.
7. Caulking of screwed joints or holes in piping will not be acceptable.
8. This Contractor shall notify the General Contractor and any 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 his scheduled tests.
9. New Sprinkler Work
    a) Testing and flushing shall be in accordance with NFPA-13 - 2013 “Standard for the Installation of Sprinkler Systems.”
    b) Each new system shall be tested to a hydrostatic pressure of 200 PSI for two hours.
    c) All existing water flow detecting devices and circuits shall be flow tested through the inspector's test connection and activate within five minutes of initiation.
10. Existing Sprinkler Systems
    a) Inspect the existing sprinkler system on the first floor per NFPA-25 – 2020 “Inspection, Testing & Maintenance of Water Based Fire Protection Systems.”
    b) Open a flushing connection at the end of the main and remove on sprinkler from the end of a branch line for the purpose of inspecting the internal condition of the

pipe and determining the presence of foreign material.

c) Inspect the internal condition of the alarm valve & riser.

d) The inspection shall be coordinated with the owner , the engineer and the local fire department with 72 hours notice. Inspection shall be witnessed by the engineer.

e) Any foreign material shall be delivered to the owner for testing for MIC.

11. Water Source

a) All flow tests on the Fire Protection systems (sprinkler and standpipe) shall be performed in the presence of the Authority having jurisdiction.

b) Sprinkler flow test discharge and flushing water discharge shall be coordinated with the General Contractor and the local water department as to acceptable discharge points prior to scheduling of flushing and tests. This contractor shall provide all hose and equipment necessary to perform the required testing and flushing.

12. As Built Drawings and Contractor Certificates

a) Contractor shall have, on hand, at time of final inspection by the Authority having jurisdiction, for Temporary / final certificate of Occupancy, all completed Certificates of Material and Testing for Aboveground and Underground Piping as well as the As- built drawings of the Fire Protection Installation.

3.03 PATCHING, REPLACEMENT AND MODIFICATION OF EXISTING WORK

A. After installation of pipelines, the Contractor shall neatly patch, repair, and/or replace existing work where damaged, removed or altered for pipe line installation. This work shall be similar and equal in quality to the work removed or damaged, unless otherwise shown or specified.

3.04 SPRINKLER HEAD INSTALLATIONS

A. Use proper tools to prevent damage during installations.

B. All pendent mounted sprinklers shall be installed on return bends.

C. All sprinkler heads installed in acoustical ceiling tiles shall be centered in tiles.

D. All Sprinkler heads shall be installed in accordance with their listing and the manufacturers' instructions.

3.05 FIRESTOPPING INSTALLATION

A. Install firestopping assembly at locations shown and as specified in accordance with UL FRD systems or FM P7825 designs, and as recommended by manufacturer.

B. Firestopping Locations: completely fill openings around penetrating items with firestopping material to prevent spread of fire in the following locations:

1. Around cable, conduit, piping, and their supports that penetrate fire-rated above grade floor slabs, interior partitions, and exterior walls.

2. Around openings and penetrations through fire-rated ceiling assemblies.

3. Around penetration of vertical fire-rated service shafts.

4. Around openings and penetrations through fire-rated enclosures.

5. Other locations indicated.

3.06 CUTTING, CORING AND PATCHING

A. Cutting and patching through existing or new construction using core drill and measuring larger than 6 inches in diameter, or 6 inches by 6 inches shall be performed by Trades specializing in the specific surfaces affected, e.g., carpentry, masonry, metals, etc., except where noted otherwise. Notify the specific Trade(s) of exact locations and sizes for openings required. The extent of masonry walls is shown on the architectural drawings along with approximate locations and sizes of existing masonry

openings. It is the Contractor's responsibility to coordinate the Work (including coordination with sub-contractors) to use the existing masonry openings to the greatest extent possible.

1. Exposed concrete coring: Notify Contractor of exact locations and sizes for all openings required in exposed concrete, to be executed under Section 03 3000 – Cast-in-Place Concrete.
2. Concrete coring less than 6 inches: Any new penetration cut through existing concrete less than 6 inches in width shall be executed by the specific Trade(s) installing the work.
3. Concrete coring 6 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 6 inches in diameter required in concrete, to be executed under Section 03 3000 – Cast-in-Place Concrete.
4. Masonry openings less than 6 inches: Any new penetration cut through existing masonry less than 6 inches in width shall be executed by the specific Trade(s) installing the work. .
5. Masonry openings 6 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 6 inches in width required in masonry, to be executed under Section 04 2113 – Brick Masonry, utilizing lintels, furnished per Section 05 5000 – Miscellaneous Metals.
6. Exposed gypsum board: Notify Contractor of exact locations and sizes for all openings required in exposed gypsum board, to be executed under Section 09 2900 – Gypsum Board Assemblies.
7. Concealed gypsum board: Any new penetration cut through existing or new concealed gypsum board less than 6 inches in width shall be executed by the specific Trade(s) installing the work. Cutting and patching larger than 6 inches in diameter, or 6 inches by 6 inches to be executed under Section 09 2900 – Gypsum Board Assemblies.
8. All cutting shall conform to the requirements of this SECTION.

END OF SECTION 21 00 00

SECTION 22 00 00
PLUMBING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. General description of work is as follows:
1. The plumbing work shall consist of furnishing and installing complete and operational systems including all required miscellaneous items. The Plumbing Contractor shall provide all supervision, labor, materials, equipment, machinery and any and all other items necessary to complete systems. The Plumbing Contractor shall note that all items of equipment are specified in the singular; however, the Plumbing Contractor shall provide and install the number of items of equipment as required for complete systems.
2. Provide new water filtter, backflow preventer and distribution system to feed the new humidifiers.
3. Provide drainage piping from the dehumidifiers to existing floor drains.
4. Relocate domestic hot and cold water piping drops to the break room sink.
5. Provide pipe insulation.
6. Provide selective demolition as required, as shown on the plans and specified herein.

B. Work in this Section includes the providing of labor, materials, equipment and services necessary for a complete and safe installation in accordance with the contract documents and all applicable codes and authorities having jurisdiction for the following:
1. Domestic Hot and Cold Water Distribution System
2. Humidifier drainage system
3. Insulation
4. Valves, Cleanouts, Escutcheons, Hangers
5. Sleeves
6. Flanges, Unions, Fittings and Couplings
7. Cleaning, Testing and Sanitizing Each Plumbing System
8. Cutting and Patching

C. Related Work and Requirements:
1. SECTION 07 84 13 PENETRATION FIRESTOPPING
2. SECTION 21 00 00 FIRE PROTECTION
3. SECTION 23 00 01 HVAC
3. SECTION 26 00 01 ELECTRICAL

1.2 WORK NOT INCLUDED

A. The following will be provided by the General Contractor:

1. Excavation and backfilling for underground work as specified in DIVISION 3 - Earthwork.
2. Concrete pads are specified in DIVISION 3 - Concrete.
3. Refer to Section 017300 Execution for Cutting & Patching.

B. Power wiring is specified in Section 260001 - Electrical, and will be provided by the Electrical Subcontractor.

1.3 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION

A. ACCESS DOORS AND FRAMES

1. Furnish access doors and frames for access to all concealed parts of the systems of this Section that require accessibility for the proper operation, maintenance and inspection of the system.
2. All Access Doors shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that the accessible components of the systems of this Section can be easily reached, and the size shall be sufficient for this purpose. When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.
3. Provide access door to match rating of the assembly into which it is installed.
4. Access doors shall be prime painted and equipped with screwdriver operated cam locks.
5. Access doors and frames shall be furnished by this SECTION to the General Contract for installation by the SECTION installing the construction into which the panel is located.
6. Access doors and frames shall comply with the requirements of Section 08 3113 “Access Doors and Frames”

1.4 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. ANSI American National Standards Institute
1430 Broadway
New York, NY 10018

2. ASME American Society of Mechanical Engineers
345 East 47th Street
New York, NY 10017

3. ASTM American Society for Testing and Materials
Philadelphia, PA 19103

4. AWWA American Water Works Association
Denver, CO 80235

5. FM Factory Mutual System
1151 Boston-Providence Turnpike
Norwood, MA 02062

6. IEEE Institute of Electrical & Electronics Engineers
345 East 47th Street
New York, NY 10017-2394

7. CISPI Cast Iron Soil Pipe Institute
1499 Chain Bridge Rd.

McLean, VA 22101

8. PDI Plumbing and Drainage Institute
1018 N. Austin Blvd.
Oak Park, IL 60302

9. NEMA National Electrical Manufacturer's Association
2101 L Street, N.W., Suite 300
Washington, DC 20037

10. NFPA National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

11. UL Underwriters' Laboratories, Inc.
333 Pfingston Road
Northbrook, IL 60062

12. OSHA Occupational Safety and Health Administration
U.S. Department of Labor
Washington, DC 20210

1.5 SUBMITTALS

A. Submit under provisions of Division 1

B. Proposed Products List:

1. Hangers and Supports
2. Insulation
3. Piping, Fittings, Unions and Couplings
4. Valves
5. Cleanouts
6. Traps
7. Escutcheons
8. Valve Tags and Pipe Identification
9. Backflow preventers
10. Water filter

C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

D. Mark dimensions and values in units to match those specified.

1.6 CODES, ORDINANCES, AND PERMITS

A. Installation of systems and equipment provided under this section shall be done in strict accordance with the State Building Code, State Plumbing Code, NFPA and any other Codes and Regulations having jurisdiction.

B. All pressure vessels shall conform to ASME and Connecticut codes and regulations.

C. All materials and installation provided under this Contract shall be done in strict accordance with the Massachusetts State Plumbing Code and NFPA.

D. Give all notices, file all plans, obtain all permits and licenses and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by Engineer, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work conforming to requirements, satisfactory to Engineer, 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.

1.7 PROJECT/SITE CONDITIONS

A. Install work in locations shown on Drawings, unless prevented by project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of Architect/Engineer before proceeding.

1.8 RECORD AS-BUILT DRAWINGS

A. Refer to Division 1, of the Specifications for record drawings and procedures to be provided under this section.

1.9 COORDINATION AND RESPONSIBILITY

A. The structure and its appurtenances, clearances and the related services, such as 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 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 he shall replace any work which may be damaged, lost or stolen, without additional cost to the Owner.

B. Where the Contractor proposes to use an item of material or equipment other than that shown or specified in the Contract Documents, he shall assume the cost of and entire responsibility for any change in his work from the work as shown or specified occasioned by approval of such item. In addition, this Subcontractor shall make all such arrangements and assume all cost occasioned by changes in the work of other trades that may be required in order to install the approved substitution; such changes shall not be a matter for subsequent Change Order increasing the Contract Sum.

1.10 PROTECTION OF WORK AND PROPERTY

A. This Subcontractor shall be responsible for the care and protection of all work included under this Section until it has been tested and accepted.

B. Protect all equipment and materials from damage from all causes including theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this Section and make good damage thus caused.

1.11 SAFETY PRECAUTIONS

A. Comply with all of the safety requirements of OSHA throughout the entire construction period of the project.

B. Furnish, place and maintain proper guards for prevention of accidents and any other necessary construction required to secure safety of life and/or property.

1.12 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. It is the intention of the Specifications and Drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the Drawings, but mentioned in the Specifications or vice-versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided by the Plumbing Subcontractor 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 Subcontractor shall follow Drawings, including his shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Engineer before proceeding with the installation. This Subcontractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. Refer to the Architectural, Structural, Fire Protection, HVAC and Electrical plans and coordinate location of all plumbing equipment.

D. Size of pipes 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 provided without charge. All work shall be installed in such a manner as to avoid being unsightly.

1.13 OPERATION AND MAINTENANCE MANUALS

A. Submit six (6) complete bound sets of operation and maintenance manuals.

B. Table of Contents:

1. Introduction:
   a. Explanation of Manual and its use
   b. Description of Piping Systems
2. Maintenance
   a. Recommended List of Spare Parts: Furnish two (2) typed sets of instructions for ordering spare parts with sectional views of the fittings or equipment showing parts numbered or labeled to facilitate ordering replacements. Each set shall include a list with the name and address of where they may be obtained.

4. Manufacturer's Literature:
   a. Valves, filters and Backflow Preventers

1.14 OPERATING AND MAINTENANCE INSTRUCTIONS

A. All operating equipment installed under this Section shall be placed in operation and shall function continuously in an operating test for a period of one week without shutdown due to mechanical failure or necessity of adjustment. Prior to scheduling the Project Final Inspection and after completion of all installation and running adjustments, this Subcontractor shall perform all work required to place the equipment in complete operating condition to meet all requirements under this Specification.

B. During this running test period, deliver to the designated representative of the Owner, through the Engineer, two (2) complete bound sets, operating, service and replacement data for all equipment which will require operating maintenance or replacement and one (1) copy of this literature shall be available during the instruction of the operating personnel while the other is checked for completeness by the Engineer. During all working hours of the "one (1) week operating test", the Subcontractor's instruction personnel shall be available for and provide thorough and detailed training to the Owner's operating and maintenance personnel in operation, maintenance and adjustment of all equipment installed.

C. Give sufficient notice to the designated operating personnel of the Owner in advance of this period. Upon completion of instruction, obtain from such representative(s) written verification on that which the above mentioned instruction has been performed; such verification to be forwarded to the Engineer.

D. Provide a training session for all maintenance personnel.

1.15 UNDERWRITERS LABEL AND LISTING

A. All electrical apparatus furnished under this Section shall be approved by UL and shall be labeled or listed where such is applicable. Where custom-built equipment is specified and the UL label or listing is not applicable to the completed product, all components used in the construction of such equipment shall be labeled or listed by UL where such is applicable to the component.

1.16 CUTTING, CORING AND PATCHING

A. Cutting and patching through existing or new construction using core drill and measuring larger than 6 inches in diameter, or 6 inches by 6 inches shall be performed by Trades specializing in the specific surfaces affected, e.g., carpentry, masonry, metals, etc., except where noted otherwise. Notify the specific Trade(s) of exact locations and sizes for openings required.

1. Exposed concrete coring: Notify Contractor of exact locations and sizes for all openings required in exposed concrete, to be executed under Section 03 3000 – Cast-in-Place Concrete.
2. Concrete coring less than 6 inches: Any new penetration cut through existing concrete less than 6 inches in width shall be executed by this SECTION.
3. Concrete coring 6 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 6 inches in diameter required in concrete, to be executed under Section 03 3000 – Cast-in-Place Concrete.
4. Masonry openings less than 6 inches: Any new penetration cut through existing masonry less than 6 inches in width shall be executed by this SECTION.
5. Masonry openings 6 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 6 inches in width required in masonry, to be executed under Section 04 2113 – Brick Masonry, utilizing lintels, furnished per Section 05 5000 – Miscellaneous Metals.
6. Exposed gypsum board: Notify Contractor of exact locations and sizes for all openings required in exposed gypsum board, to be executed under Section 09 2900 – Gypsum Board Assemblies.
7. Concealed gypsum board: Any new penetration cut through existing or new concealed gypsum board less than 6 inches in width shall be executed by this SECTION. Cutting and patching larger than 6 inches in diameter, or 6 inches by 6 inches to be executed under Section 09 2900 – Gypsum Board Assemblies.
8. All cutting shall conform to the requirements of Section 01 7300 – Execution, and 02 4119 – Demolition. Notify Architect prior to any cutting or coring larger than 2 inches.

1.17 GUARANTEE

A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this Section. Such warranties shall be in addition to and not in lieu of all liabilities which the manufacturer and Subcontractor may have by law or by provisions of the Contract Documents. All warranties shall be submitted prior to Final Payment.

B. All materials, equipment and work furnished under this Section shall be guaranteed against all defects in materials and workmanship for a minimum period of one (1) year commencing with the date of Substantial Completion. Any failure due to defective material, equipment or workmanship which may develop, shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.

C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Drawings.

D. Upon receipts of notice from the Owner of the failure of any part of the systems during the guarantee period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.18 ELECTRICAL WORK

A. All electrical apparatus and controls furnished as a part of the work of this Section, but which are not integral with the equipment served, will be mounted by the Electrical Subcontractor and all wiring will be done under DIVISION 26 - ELECTRICAL.

B. Except for electrical apparatus specifically called for as part of this Section, all switches and controllers required will be provided under DIVISION 26 - ELECTRICAL.

C. All electrical apparatus and controls furnished as a part of the plumbing work shall conform to applicable requirements under DIVISION 26 - ELECTRICAL.

D. All motors furnished under this Section shall be furnished by the manufacturer of the equipment served and shall be mounted and aligned so as to run free and true. Each motor shall be built to conform to the latest applicable NEMA, ANSI and IEEE standards for the type and duty of service it is to perform.

E. Each motor shall be designed to operate on 60 Hz., and each shall be expressly wound for the voltage specified. Each motor shall operate successfully at rated load and frequency with a voltage variation of plus or minus 10 percent of voltage specified.

F. All motors less than 1/2 HP shall be constructed for 120 volt single phase operation, and all motors of 1/2 HP and larger shall be constructed for 208 volts, 3 phase operation, except where noted. All motors 1 HP and larger shall have grease lubricated ball bearings and approved grease fittings.

G. All motors shall be provided with adequate starting and protective equipment, and each shall have a terminal box of adequate size to accommodate the required conduit and wires.

H. Motor controllers shall be equipped with all poles, auxiliary contacts and other devices necessary to permit the interlocking and control sequences required. Controller operating coils shall be generally designed for 120 volt operation, and 3 phase motors shall be provided with thermal overload protection in all phases.

I. This Subcontractor shall furnish all magnetic starters for each and every motor furnished under this section of the specification. The Electric Subcontractor shall install and wire the starter.

1.19 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.

1.20 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 subcontractors. Furnish all supports required for installation of apparatus herein specified.

1.21 MATERIAL AND EQUIPMENT STANDARDS

A. All equipment and material must be approved by the Engineer prior to use.

B. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved.

1.22 SUPERVISION

A. Supply the service of an experienced and competent supervisor who shall be in charge of the plumbing work at the site.

1.23 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site and store and protect same under the provisions of Division I, GENERAL REQUIREMENTS.

B. Thoroughly inspect all plumbing equipment and materials upon receipt at the job site for damage and correctness.

1.24 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 Engineer.

1.25 SLEEVES, INSERTS, ANCHOR BOLTS, AND PLATES

A. Be responsible for the location of and the maintaining in proper position all sleeves, inserts and anchor bolts supplied and/or set in place. In the event that failure to do so requires cutting and patching of finished work, it shall be done at this Subcontractor's expense without any additional cost to the Owner.

B. Sleeves passing through fire-walls shall be made tight using approved caulking or fireproofing materials as necessary.

1.26 DEFINITIONS

A. As used in this Section, the following items are understood to have the following meaning:

1. "Subcontractor", unless otherwise qualified, shall mean the installer of the work specified under this Section.

2. "Furnish" shall mean purchase and deliver to the project site, complete with every necessary appurtenance.
3. "Install" shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.
4. "Provide" shall mean "Furnish" and "Install".
5. "Work" shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.
6. "Concealed" shall mean hidden from sight in chases, furred-in spaces, shafts, hung ceilings, embedded in construction or in a crawl space. Areas to be concealed as part of tenant alterations to the building shall also be considered in this definition.
7. "Exposed" shall mean not installed underground or concealed as defined above.
8. "Work by others" shall mean work not provided by the Plumbing Subcontractor, but work furnished and/or installed by other Contractors (performing their respective work) as a part of this contract.
9. "Coordinate" shall mean all plumbing work in compliance with other trades.

1.27 HOISTING, SCAFFOLDING AND PLANKING

A. All staging, exterior and interior, required to be over eight feet in height, shall be furnished and erected by the General Contractor and maintained in safe condition by him without charge to and for the use of all trades as needed by them for proper execution of their work, except where specified to the contrary in any filed sub-bid Section of the Specification.

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 Architect prior to commencement of such erecting and dismantling work.

B. Any staging that is up to eight (8) feet in height shall be furnished and erected by the applicable Subcontractor.

1.28 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 nor 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 desired.

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/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 Architect's/Engineer'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. Prepare and submit for approval 3/8 inch scale or larger working drawings and sections, clearly showing how this work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause

interference with work of other trades, make changes necessary to protect conditions without extra charge.

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. All distribution systems which require pitch or slope such as sanitary drains and water piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.

F. Where there is evidence that work of this Subcontractor will interfere with the work of other trades, this Subcontractor shall assist in working out space conditions to make satisfactory adjustments.

G. This Subcontractor shall, with the approval of the Engineer and without extra charge, make reasonable modifications in his work as required by structural interference's, or by interference with work of other trades, or for proper execution of the work.

H. If this Subcontractor installs his work before coordinating with other trades and his work causes interference with the work of such other trades, he shall make all necessary changes in his work to correct the condition without extra charge and as directed by the Engineer.

I. 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.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS - GENERAL

A. Materials and equipment shall be of the best quality manufacture, new, unused and free from all defects.

B. Reference to specifications or recognized authorities to establish basis of quality shall be latest edition in force at date of bidding.

C. All exposed water and waste piping and fittings not required to be insulated shall be chromium plated.

2.02 WATER PIPE AND FITTINGS

A. All aboveground water pipe and fittings shall be Type L hard drawn ASTM B8872 copper tubing, with cast brass or wrought copper fittings, no lead, 95/5 soldered or brazed.

B. All water piping located below the floor slab and/or underground outside the building shall be type “K” seamless copper with cast brass fittings. No fittings shall be allowed below the floor slab.

2.03 DRAINAGE, WASTE AND FITTINGS

A. Above ground piping up to 2-1/2" shall be DWV copper with cast brass or wrought copper solder joint type drainage fittings. Exposed piping shall be chrome-plated.

2.04 VALVES

A. General
   1. Furnish and install valves, where indicated on Drawings or specified, so located that they may be operated, repaired or replaced with a minimum effort and repacked under pressure.
   2. The basic system of valves (i.e., gate, ball, check for water service) shall be of one manufacturer.
   3. Access panels shall be furnished by this Contractor for all valves concealed within non-removable ceilings or walls. Coordinate access panel type and location with Architect. Access panels shall be installed by the General Contractor.

B. Water Valves
   1. Drain valves shall consist of hose end valve designed for 200 psi with threaded cap and chain. Provide at all low points in water piping system and at the base of all risers so that entire system may be drained. Apollo 78 Series with ¾" hose connections, cap and drain.
   2. Check valves shall be horizontal regrinding swing 200#, Milwaukee 1509.
   3. Ball valves shall be with stainless steel stem and ball, full port, bronze, solder end, designed for 150 psi, Milwaukee BA150S.
   4. All fixture supplies and supplies to equipment not already furnished as such shall have chrome plated brass angle or straight ¼ turn stops, unless otherwise specified.

C. All unions shall be suitable for working pressure of not less than 200# water working pressure and shall be of size and material of adjacent piping. All units to be ground-joint type.

D. All flanges shall be companion type, faced and drilled for not less than 200# water working pressure, complete with necessary adapter, and non-asbestos gasket, and shall be size and material of adjacent piping.

2.05 HANGERS, INSERTS AND SUPPORTS

A. All piping shall be rigidly supported from the building structures by means of approved hangers and supports. Piping shall be supported to maintain required grading and pitching of line, to prevent vibration and to secure piping in place, and shall be arranged so as to provide for expansion and contraction. In no case shall risers or mains contact building structures.

B. All materials specified in this section which occur above suspended ceilings shall be supported directly from the building structures. The suspended ceiling system shall not be utilized to support any plumbing materials. All hangers, inserts and supports shall be Carpenter Paterson, Calco, Walworth, or approved equal. Carpenter Paterson numbers listed.

C. All hangers shall be secured to approved, adjustable type inserts wherever possible and practicable. Field drilling, where required, shall be by the Plumbing Subcontractor. The use of explosives is prohibited.

D. All soil, waste, vent, storm drain and water pipes shall have friction clamps at each floor.

E. Hangers for the piping 2" and smaller shall be Type A bands, or the approved equivalent. Hangers for piping larger than 2" shall be of the adjustable clevis hanger type similar to Figure 100. Hanger rods shall be machine threaded ends only. The use of wire, wood blocks and tubing used as braces is prohibited. Hangers for under slab piping shall be stainless steel.

F. Where pipes are installed in groups, corrosion resistant gang hangers with heavy copper coated saddles shall be used in all locations. Size of channel or angle for gang hangers shall be of proper size to prevent sag or breakage, with intermediate rods provided where required.

G. Double nut all hangers.

H. Inserts: Figures 266 and 650. Each hot dipped galvanized.

I. Anchors for hot water lines shall be independent from all other hangers.

J. Size of hanger rods shall be not less than the following:

Pipe Size	Rod Diameter
3/4" to 1-1/2"	3/8"
2" to 3-1/2"	1/2"
4" to 5"	5/8"
6" to 10"	3/4"

All rods used under slab shall be stainless steel.

K. All hangers used with un-insulated copper piping shall be heavy PVC coated.

L. Provide insulation shield at all hangers supporting insulated pipe.

M. Spacing of hangers for horizontal piping shall be in accordance with the Code and the following:

1. Cast Iron: < 10'-0" length 5'-0" o.c.
   ≥ 10'-0" lengths 10'-0" o.c.
2. PVC: 1½" and smaller 3'-0" o.c.
   2" and larger 4'-0" o.c.
3. Copper: 1¼" and smaller 6'-0" o.c.
   1½" and larger 10'-0"o.c.
4. Steel: ¾" or 1" 8'-0" o.c.
   1¼" and larger 10'-0" o.c.

N. If Codes having jurisdiction require closer spacing, the hanger spacing shall be as required by Code in lieu of the foregoing. Provide hangers at all changes in direction and on both sides of concentrated loads (pumps, valves, strainers, regulators, etc.).

2.06 SLEEVES

A. Approved sleeves for the passage of all systems through walls, ceilings, floors and partitions shall be furnished and set by the Plumbing Subcontractor. Sleeves shall be set in ample time for building into the construction.

B. Sleeves shall be one piece galvanized Schedule 40 steel pipe. Provide water stop where required.

C. Sleeves through walls and partitions shall be set flush with finish line both sides of the wall.

D. The pipe to sleeve annular space shall be sealed with modular mechanical type, interlocking synthetic rubber links shaped to continuously fill the annular space. This method shall be used for all pipes and sleeves passing through water-proof floors and outside walls.

E. Sleeves in concealed pipe chases may be sheet metal.

F. Sleeves on insulated lines shall be of sufficient size to permit the pipe insulation to be continuous through wall and floor openings.

G. Sleeves through floors shall extend 1" above finish of floor, and the space between the inside of the sleeve and the O.D. of pipe shall be packed with oakum and a 1" deep ring of lead, finished flush with top of sleeves. Pipe sleeves for water lines shall be of sufficient size to permit continuous insulation on pipe without crushing the insulation.

H. Ream all sleeves.

I. Sleeves through fire rated floors and walls shall be sealed smoke and water tight using an approved fire stopping system as manufactured by STI or equal. Fire-stopping shall be installed per manufacturer's recommendations.

2.07 CLEANOUTS

A. Provide and connect cleanouts with brass caps and screws same size as pipe, and close gas tight where indicated on the drawings, at the ends of all branches, on soil and waste piping, and in such other portions of the piping where the run is over 50 feet. Provide cleanouts at base of all stacks where stacks enter floor.

B. Where stacks enter drains near walls or piers causing difficult access to end cleanouts, there shall be a vertical cleanout stack just above the floor with a 90 degree bend at foot of the stack.

C. Where such conditions occur in walls or partitions, the cleanout cover shall be accessible through an opening left in the wall and covered with a flush chromium plated brass plate or access panel securely fastened in place.

D. Brass cleanouts shall be of solid nut construction.

E. Provide Owner with three wrenches for removing flush cleanout plugs.

F. Floor cleanouts shall consist of dura coated cast iron body, inside caulk outlet, cadmium plated iron plug, lead seal, adjustable nickel bronze top, Zurn, Smith, Josam or approved equal. For concrete floor ZN1405-2. For vinyl composition tile ZN1405-6. For heavy traffic unfinished areas Z1425-27 with cast iron top.

G. Wall cleanouts, ZN1445-1 cast iron supreme cleanout tee with cadmium plated plug, lead, seal and round stainless steel access cover with securing screw.

2.08 INSULATION

A. Scope: The following piping, fittings and valves shall be insulated.

1. All new domestic cold water piping.
2. All new domestic hot water piping.
3. Supplies, stops and waste piping under the ADA compliant sinks: Truboro or equal.

B. General: The pipe covering specified herein for piping system shall be provided in strict accordance with the manufacturer's printed instructions, the best practice of the trade and to the full intent of this specification.

1. The sealers, tapes, adhesives and mastics used in conjunction with the installation of the pipe covering specified herein shall possess the maximum possible fire-safe qualities available and shall be of a type approved by Factory Mutual, Factory Insurance Association or National Fire Protection Association.
2. Valves, fittings, flanges and accessories shall have the same thickness of pipe covering applied as the adjacent pipe. Pipe covering for these items shall be factory PVC molded type.
3. Longitudinal seams and butt joint shall be sealed with a fire retardant, vapor barrier adhesive.

C. Interior Cold Water and Hot Water System Piping

1. All interior cold water piping insulation except as herein noted shall be four pound density, fiberglass with factory applied white, fire retardant, reinforced, ASJ, vapor barrier jacket, ½ inch thick for piping up to 1-¼",1 inch thick for piping 1-½" and larger, and 1½ inches thick where protected by freeze protection . Insulation shall be continuous through sleeves.

2. All interior hot water piping insulation except as herein noted shall be four pound density, fiberglass with factory applied white, fire retardant, reinforced, ASJ, vapor barrier jacket, 1 inch thick. Insulation shall be continuous through sleeves.
3. Ends of insulation at termination points shall be sealed to the pipe with a pre-molded PVC type fitting. Pipe, fittings and valves shall be provided with pre-molded PVC covers with fiberglass inserts.
4. Pipe insulation in wet or exterior locations and within 6'-0" of finished floor in exposed installations shall be provided with 20 mil. PVC continuous covers in addition to the vapor barrier jacket. Fittings and seams shall be solvent welded.
5. Insulation shall have a maximum thermal conductivity of 0.27 BTU/in/hr SF ºF.

D. Insulation at hangers shall be protected with sheet metal saddles.

E. Insulation on buried piping shall be ASTM C 552 cellular glass insulation rated for direct burial.
1. Provide waterproof jacked and seal
2. Buried insulation maximum thermal conductivity of 0.28 BTU/in/hr SF ºF.
3. Buried insulation shall be impermeable to water and impervious to acids.
4. Buried insulation shall have a compressive strength of 90 psi

F. Fire Hazard Rating: Insulation materials, coatings and other accessories shall individually have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed. Ratings shall be determined by U.L. “Test Method for Fire Hazard Classification of Building Materials’, No. 823 or NFPA No. 225 or ASTM E84”.

2.09 ESCUTCHEONS

A. Escutcheons shall be pipe set in mastic at all sleeves through floors.

B. Escutcheons shall be chrome plated heavy brass, fitting the pipe and covering snugly, secured in place by set screw or clips. Provide escutcheons at all pipes penetrating walls and floors in finished rooms.

C. Coordinate escutcheon diameters and locations with Tile Subcontractor. Exposed tile cuts will not be acceptable.

2.10 MISCELLANEOUS FITTINGS AND SPECIALTIES

A. All fittings and specialties shall be all bronze, of the same manufacturer, equal to Watts, Fisher, or Conbraco Manufacturing Company. Model Nos. are taken from the Watts Catalog.

B. Air-gap for backflow preventers - AG series.

C. Vacuum breakers - No. 800.

D. Strainers - No. 777.

E. Pressure relief valve - No. 3L.

2.11 FIRESTOPPING

A. Firestopping shall be furnished and installed by this section wherever the work of this section penetrates fire-rated assemblies.

B. Firestopping by this section shall comply with the requirements of section 078413 PENETRATION FIRESTOPPING..

2.12 ACCESS PANELS

A. Furnish access panels, for installation by the General Contractor, in wall and ceilings at locations indicated on Drawings or as required to permit access for adjustment, removal, and replacement of all equipment, such as valves, traps, vacuum breakers, clean outs, and all other items requiring maintenance and adjustment.

B. All access panels shall be located in closets, storage rooms and/or other non-public areas where appropriate, in a skillful and competent manner, positioned so that the junction can be easily reached. The size shall be sufficient for its intended purpose (minimum 16" x 16"). When access panels are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

C. Access panels shall be of steel, prime painted and furnished with cylindrical lock, as manufactured by Milnor, Miami-Carey, Way-Loctor or approved equal. Access panels located in Fire Rated walls and ceilings shall bear the U.L. Label ensuring fire-rated construction as applicable to the fire rating of the assembly.

2.13 SYSTEMS IDENTIFICATION

A. All piping shall be identified as to contents and direction of flow in intervals not exceeding ten (10) feet, at each change in direction, and on both sides of penetrations through walls, floors, and/or ceilings.

B. All systems identification materials shall meet ANSI standard A13.1-1996 and be as manufactured by Seton Name Plate Corporation or approved equal.

C. Valve tags shall be circular 19 gauge brass, 1½” in diameter, with black filled text Seton No. M4506 with No. 16197 brass hooks, No. 16182 bass jack chain, or No. 6 nickel-plated bead chain. Letter abbreviations shall be 1¼” high above ½” high numbers. Provide three (3) laminated valve tag charts indicating valve number, valve location, pipe contents, and equipment or area served.

D. Pipe markers shall be set mark type pre-molded acrylic plastic, snap on markers either 8” or 12” long with overlap. The background, field and legend colors and letter sizes shall be per ANSI A13.1 – 1996 standards.

2.14 PRESSURE GAUGES

A. Pressure gauges shall be as manufactured by Ashcroft; Trerice; Manning, Maxwell and Moore; or approved equal.

B. Gauges shall have 2½" diameter case, phosphor bronze bourdon tube, and 1% full-scale accuracy. Gauge range shall be 0 to 60 psi.

C. Gauges shall be installed on the inlet and outlet of each pump and/or circulator.

D. All gauges shall be installed with petcocks and pulsation dampers.

2.15 BACKFLOW PREVENTERS

A. Provide a dual check valve on the incoming domestic water line. Provide with ball valves and strainer.
B. Vacuum breakers at all hose bibs and outlets subject to backflow shall be atmospheric type. Provide pressure type for all outlets subject to back pressure or static line pressure.
C. Installation of all backflow preventers shall be in accordance with State Plumbing Code and the Groveland water department.
D. Backflow preventers shall be registered with and approved by the Groveland Water Department prior to installation. Provide all required device design data sheets.
E. Plumbing Subcontractor shall provide repair kits for each dual check backflow preventer.

PART 3 - EXECUTION

3.01 DRAINAGE PIPING

A. Pipes shall be plumb and parallel to building walls, beams and columns. All horizontal lines shall be evenly pitched and properly secured with iron or steel hangers. A pitch of 1/4" per lineal foot shall be maintained on all soil and waste lines, wherever possible. Where long runs of piping require less pitch, due to space restrictions, a lesser pitch shall be allowed on main lines 4" and over in size, but, in no event, should any pipeline have a slope less than 1/8" per linear foot.

B. Carefully lay out the work in advance so that the pipes will pass through the opening and permit the proper pitch to the pipeline.

C. Carefully coordinate the work with that of other trades, so as to avoid the necessity of taking down work installed without prior checking.

D. All piping under slab shall be hung with stainless steel rods and hangers from slab.

3.02 WATER PIPING

A. Pipe used in piping assembly shall be clean of dirt and obstructions and shall have ends square and reamed before putting into the fittings.

B. Cut the tube to required length with a tube cutter

C. Remove burrs from the inside and outside of the cut edge and clean the end of the tube with steel wool or sand cloth until the discoloration is removed and metal is smooth and bright.

D. Oxides shall be removed by mechanical means (sand cloth, steel wool, brush, etc.).

E. Removal of oxides or discoloration of pipe and fittings by acids or self cleaning flux is forbidden.

F. Apply a thin, uniform and complete coating of reliable brand of soldering flux to the cleaned surfaces of the tube and fittings.

G. When joint is soldered, remove excess solder with a cloth or brush leaving a fillet of solder in the chamber at the end of the fitting.

H. All piping shall be true and plumb and with proper pitch for draining after soldering.

3.03 DISINFECTION OF WATER SYSTEMS

A. The entire new water piping system shall be thoroughly disinfected with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or sodium hypochlorite solution, shall be introduced into the new system and drawn to all points in the new system.

The disinfection solution shall be allowed to remain in the system for a period of 8 hours, during which period all valves and faucets shall be opened and closed several times. After disinfection, the solution shall be flushed from the system with clear water until the residual chlorine content is not greater than 0.2 parts per million.

B. This work shall be supervised or done by an approved chemical testing laboratory and results sent to the Engineer or his representative for verification.

3.04 HANGERS

A. Pipe hangers of the types specified shall be installed for the support of all piping. Maximum center-to-center hanger spacing shall be as follows, except as otherwise indicated on the Drawings.

Pipe Size	Max. Spacing
Up to 1-1/4"	5'-0"
1-1/2" to 3"	8'-0"
4" and larger	10'-0"

3.05 ESCUTCHEONS

A. Where exposed pipes pass through floor, ceilings, walls, or partitions, there shall be installed adjustable cast or spun chrome-plated brass escutcheons of approved sizes and make.

3.06 WORKMANSHIP

A. Obtain detailed information from the manufacturer of apparatus for the proper methods of installation. Obtain all information from other Contractors which may be necessary to facilitate his work and the completion of the whole project.

B. All of the work shall be executed in a workmanlike manner by experienced mechanics, in accordance with all applicable plumbing regulations and the most modern trade practices and shall present a neat appearance when completed.

C. The Plumbing Subcontractor, before installing any of his work, shall see that it does not interfere with the clearances required for other work. The Plumbing Subcontractor shall make himself familiar with the plans and specifications of all trades to prevent interference's and assure complete coordination.

3.07 PIPE SLEEVES

A. Be responsible for the location, setting and anchoring of sleeves in a substantial manner so that the sleeves will not become displaced.

3.08 TESTING OF WATER PIPING SYSTEMS

A. General

1. All piping systems shall be subject to testing as noted and shall hold tight at the pressure head stated for the time interval required without adding air or water. While any system is being tested, required head or pressure shall be maintained until all joints are inspected.
2. All equipment, material and labor required for testing any of the various systems or any part thereof shall be provided by the Plumbing Subcontractor.

B. Interior Sanitary Systems

1. Water test shall be applied to these drainage systems, in sections, as required, after rough piping has been installed. Each opening shall be tightly closed, except the highest opening in the section under test, and each section shall be filled with water, but no section shall be tested with less than a 10' head of water. In testing successive sections, at least the upper 10' of the next preceding section shall be tested so that no point of pipe in the building (except the uppermost 10' of the system) shall be submitted to a test of less than 10' head of water. The water shall be kept in the system for at least 30 minutes before inspection starts; the system shall then be made tight at all points.
2. Any points of the drainage systems to be tested with air instead of water shall be made by attaching an air compressor testing apparatus to any suitable opening and after closing all other inlets, forcing air into the system until there is a uniform gauge pressure of 5 psi or sufficient to balance a column of mercury 10" high. This pressure shall be held without the introduction of additional air for a period of at least 30 minutes.

C. Domestic Water Piping Systems

1. Upon completion of the entire interior water supply system or a section of it as required, it shall be tested and proved tight under a water pressure of 150 psi. Gauge should be located at the lowest point in the system and pressure shall hold for a period of one hour without introducing additional water. The water used for testing shall be from a potable source of supply.

D. Additional Tests

1. Provide all additional tests, such as smoke or pressure tests, as required by the regulations or as directed by authorities making the inspection.
2. Provide for any repeated test as directed by the Architect/Engineer to make all systems tight as required.

E. Defective Work

If inspection or tests show defects, such defective work or materials shall be replaced and inspections and tests repeated, at no additional cost to the Owner. Repairs to piping shall be made with new material. No caulking of screwed joints or holes will be acceptable.

3.09 CLEANING AND ADJUSTING

A. 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. Any stoppage or discoloration or other damage to parts of the building, its finish or furnishings, due to this Subcontractor's failure to properly clean the piping system, shall be repaired by this Subcontractor without cost to the Owner.

B. At the completion of the work, the hot water system shall be adjusted for uniform circulation to the satisfaction of the Engineer. Flush valves and other parts of the work shall be adjusted for quiet operation. Automatic control devices shall be adjusted for proper operation. All fixtures and metal work shall be cleaned and polished.

C. During the progress of the plumbing work, clean up and remove all oil, grease and other debris caused by this work. At completion, clean all equipment and piping systems and leave all work in perfect operating condition.

3.10 INSULATION

A. All insulation shall be installed in strict accordance with the manufacturer's recommendations and shall be applied by a qualified insulation contractor.

B. Covering shall not be applied on any apparatus or piping until the apparatus and piping have been thoroughly cleaned, tested, and accepted as tight.

C. All insulation ends shall be covered with jackets drawn tightly and firmly sealed or painted with sealant.

3.11 ARRANGEMENT OF PIPING AND INSTALLATION

A. The word "piping" in this paragraph means all pipe, fittings, nipples and valves in systems and shall be considered as such in this installation.

B. In general - This Subcontractor shall fully inform himself regarding all furred ceilings, pipe spaces, walls, etc., in which his pipes are to run and see to it that his pipes do not require more than the available furred space. If, for any reason, changes in location of piping are made, the Plumbing Subcontractor shall make sure his pipes are not run in rooms which are to be clear of pipes.

C. Install the work in such a manner that where pipes are hung from structure above, pipes shall be as close to steel and deck as possible and advantages taken wherever possible of construction by installing pipes up between the beams.

D. Promptly install all drains and piping after excavation or cutting for same has been done with all openings to be left overnight closed tightly. No piping shall, however, be permanently closed up, furred in, or covered before testing and the examination of same by the Engineer.

E. All drainage piping shall run as straight and as plumb as possible and shall have easy bends with long turns; all offsets shall be made at an angle of 45 degrees or less.

F. Extend to roof full size, all lines of soil, waste and vent piping in stacks with all branches required and with the return tees for vent risers and with extensions through the roof as required. Vents shall extend not less than 24" above roof.

G. All horizontal sanitary piping shall be run on a uniform grade of not less than 1/8" per foot, unless otherwise shown. All vent piping to be graded so as to free itself quickly of any waste or condensation.

H. Where an end circuit vent pipe from any fixture or line of fixtures is connected to a vent line serving other fixtures, the connection shall be at least three feet or sufficiently above the floor on which the fixtures are located to prevent the use of the vent line as a waste.

I. All changes in pipe size and direction on soil and waste lines shall be made with wyes and cleanouts, reducing fittings or recessed reducers.

J. Wyes and 45 degree fitting or 45 degree combination fittings shall be used whenever possible.

K. Sanitary long sweep bends and wyes shall be used for connection to branch lines for fixtures and wyes on vertical runs of pipe.

L. Long turn fittings shall be used whenever conditions permit. Short radius fittings may be installed only when in conformity with the State Building Code.

M All water piping shall have a minimum pitch of 1" in 40'-0" concealed, free of traps and unnecessary bends and arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical work such as ducts, flues, conduits, and other work. Pipes to be run parallel to each other and hot and cold water to be not less than 6' apart.

O. The piping shall be so graded and valved as to provide for the complete drainage control of the systems.

P. The entire plumbing system shall be supplied with valves, so located, arranged and operated to give complete regulating control of the hot and cold water systems and at all plumbing fixtures.

Q. All piping shall have reducing fittings used for reducers or increasers where any change in pipe size occurs.

R. Each piece of pipe and each fitting shall be carefully inspected for defective workmanship or obstructions in the pipes or fittings.

S. Each piece of screw pipe or tubing shall be reamed or filed after cutting and all burrs cleanly removed.

T. All hot water branches shall be taken off risers or mains with 3-fitting and long spring connections.

3.12 CROSS AND INTER-CONNECTIONS

A. No plumbing fixture, device or piping shall be installed which will provide a cross or interconnection between a distributing water supply for drinking or domestic purposes and a polluted supply such as a drainage system or a soil or waste pipe which will permit or make possible the back-flow of sewage, polluted water or waste into the water supply system.

3.13 VALVE TAGS, NAMEPLATES, AND CHARTS

A. All new valves on pipes of every description shall have neat circular brass valve tags of at least 1-1/2 inches in diameter, attached with brass hook to each valve stem. Stamp on these valve tags in letters as large as practical the number of the valve and the service, such as: "H.W.", "C.W.", for hot water and cold water respectively. The numbers of each service shall be consecutive.

B. All valves on tanks and pumps shall be numbered by 3 inch red metal discs with white numbers 2 inches high secured to stem of valves by means of brass hooks or small solid link brass chain.

C. Plumbing Subcontractor shall indicate the valves on the Record Drawings and on two printed detailed lists. These printed lists shall state the numbers and locations of each valve and the fixture or group of fixtures which it controls, and other necessary information,

such as requiring the opening or closing of another valve or valves, when any one valve is to be opened or closed.

D. These printed lists shall be typed or Leroy, prepared in form to meet approval of the Engineer and shall be framed under glass.

3.14 PIPE IDENTIFICATION

A. Provide color-coded pipe identification markers on all piping in the building installed under this Section. Pipe markers shall be heavy plastic-faced cloth labels with heat-resistant backing, "Set Mark" by Seton nameplate Corporation, Zipper tubing Co., W. H. Brady Company or approved equal.

B. Provide an arrow marker with each pipe content marker to indicate the direction of flow.

C. Piping mains shall be labeled at 20-foot intervals adjacent to each valve and at both sides of wall penetrations. This work shall be done after finish painting has been completed.

D. The following color coding shall be used with names in black letters on backgrounds indicated:

Description		Color
Domestic Cold Water Supply	(CW)	Green
Domestic Hot Water Supply	(HW)	Yellow
Drain		Yellow

E. In general, a 2-inch high legend shall be used for pipe lines 4 inch diameter and larger, and a 3/4 inch high legend shall be used for pipe lines 3 inch diameter and smaller.

F. All markers shall be OSHA approved.

3.15 INSTALLATION OF FIRESTOPPING

A. PRIVATE Examination

1. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Preparation

1. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
   a. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
   b. 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 form cleaning operation.
   c. Remove laitance and form-release agents from concrete.

2. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primes to areas of bond; do not allow spillage and migration onto exposed surfaces.
3. 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.

C. Through Penetration Firestop System Installation

1. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings f or products and applications indicated.
2. Install forming/damming/backing materials and other accessories of types required to support fill materials during the their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
    a. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of fire stop systems.
3. Install fill materials for firestop systems by proven techniques to produce the following results:
    a. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance systems.
    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.

D. Field Quality Control

1. Inspecting Agency: Contractor will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports. I. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.
2. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.
3. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements. .

E. Identification

1. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels.

a. The words: "Warning-Through-Penetration Firestop System -Do Not Disturb. Notify Building Management of Any Damage."

b. Contractor's name, address, and phone number.

c. Through-penetration firestop system designation of applicable testing and inspecting agency.

d. Date of installation.

e. Through-penetration firestop system manufacturer's name.

f. Installer's name.

F. Cleaning and Protection

1. 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.

2. Provide final protection and maintain conditions during and after installation that ensure 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 through-penetration firestop systems complying with specified requirements.

G. Through-Penetration Firestop System Schedule

1. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL' s "Fire Resistance Directory" under product Category XHEZ.

2. Schedule of construction components, type of penetrant, and UL Through-penetration Firestop Systems include, but are not limited to the following:

	PENETRANT							
	No Penetration Hems	Metal Conduit	Cable Tray	Cables	Non-Insul. Metal Pipe	Insul. Pipe	RF Polypropylene Pipe	Insul. Metal Duct
GWB/Stud Wall up to 2 Hr Rating	WO 0002	WL 1029	WL 4005[4] WL 4004[5]	WL 3024	WL 1029	WL 5014	WL 2029	WL 5033[3]
CMU Wall up to 2 Hr Rating[2]	WJ 0001	CAJ 1079	WL 4009[4] WL 4020[5]	CAJ 3043	CAJ 1079	CAJ 5021	CAJ 2063 or CAJ 2105[7]	CAJ 5058[3]
Concrete Floor 1 Hr Rated T-Rating[2]		CAJ 1008	CAJ 4008[5]	CAJ 3001	CAJ 1008	CAJ 5021	CAJ 2063 or CAJ 2105[7]	CAJ 7009[6]

Concrete Floor up to 2 Hr Rated[1]		CAJ 1079	CAJ 4020[5]	CAJ 3043	CAJ 1079	CAJ 5010	CAJ 2063 or CAJ 2105[7]	CAJ 7009[6]

KEY TO NOTES:

1. Penetration within wall cavity.
2. Penetration that does not fall within wall cavity, T -rating required.
3. The firestopping system for this combination of penetrant, wall/floor assembly, and fire rating is an Engineering Judgment by the firestopping manufacturer based upon the UL System listed.
4. Aluminum cable tray.
5. Steel or aluminum cable tray.
6. For floor penetrations not enclosed above and below the floor with shaft wall.
7. Refer to UL assembly for pipe size restrictions.

3.16 OPERATION AND START-UP

A. Furnish all labor, equipment, materials, and test necessary to place all equipment and Systems into operation, and obtain approval of the entire Plumbing System from the local building department.

B. Materials, fixtures and fittings shall be properly protected and all pipe openings shall be temporarily closed so as to prevent obstructions and damage.

C. Prior to final inspection, clean all fixtures and flush all piping and equipment and then place all equipment and fixtures into working order to demonstrate the fitness of the installation.

3.17 COORDINATION

A. The structure and its appurtenances, clearances and the related services, such as plumbing, heating, ventilation, and electric service, have been planned to be adequate and suitable for the installation of equipment specified under this Section. The Owner will not assume any increase in cost caused by differing Requirements peculiar to a particular make or type of equipment, and any such incidental cost shall be borne by this Contractor.

B. This Contractor shall be responsible for Work and equipment furnished and installed by him or his Subcontractor(s) until the completion and final acceptance of this Contract, and he shall replace any Work that may be damaged, lost, or stolen, without additional cost to the Owner.

C. Cutting and Patching - It shall be the duty of this Contractor to consult with and give to the General Contractor, the exact location and size of all openings and full information as to cutting and patching necessary for the same.

D. In the event this Contractor fails to provide sleeves, inserts, and templates or fails to notify other Contractors well in advance of his Requirement, he shall be responsible for paying for all cutting and patching made necessary by his failure to do so.

E. The location and method of attaching supports for plumbing equipment to the building structure shall be coordinated with the Architect and General Contractor prior to the installation of any equipment. This Contractor shall take necessary precautions to insure the building structure and components are not overstressed by the support of plumbing equipment.

F. In the event there is a conflict or inadequate space for the proper installation of plumbing Systems, this Contractor shall prepare a scaled (¼" = 1'-0" min.) composite sketch, showing the building structure and all equipment and items affecting the installation, to clearly identify the areas of conflict. This Contractor shall submit four (4) copies of the sketch, along with a written explanation of the problem, to the Engineer for his review and determination on what action to take to resolve the conflict.

G. It shall be the duty of this Contractor to furnish full information to all Trades relative to the Work they are to do in connection with Work under this Section. This includes data for wiring, including wiring diagrams, equipment foundations, pipe connections, etc., furnished under other Sections.

3.18 PAINTING

A. This Contractor shall apply one coat of anti-rust primer and two coats of anti-rust flat black enamel to all steel support hangers and other steel or iron elements of the Plumbing System, furnished and installed by him. Paint shall be omitted from all items with a galvanized finish.

B. Paint all gas piping with one coat of anti-rust primer and two coats of anti-rust yellow enamel.

C. All surfaces to be painted shall be free of dirt, scale, rust, grease, and oil. Paint shall be applied in accordance with the Manufacturer's Requirements.

D. This Contractor shall touch up, with spray paint, all scratched or damaged surfaces of equipment with factory finish. Spray paint shall be the same color and type as factory finish.

3.19 CUTTING, CORING AND PATCHING

A. Cutting and patching through existing or new construction using core drill and measuring larger than 6 inches in diameter, or 6 inches by 6 inches shall be performed by Trades specializing in the specific surfaces affected, e.g., carpentry, masonry, metals, etc., except where noted otherwise. Notify the specific Trade(s) of exact locations and sizes for openings required. The extent of masonry walls is shown on the architectural drawings along with approximate locations and sizes of existing masonry openings. It is the Contractor's responsibility to coordinate the Work (including coordination with sub-contractors) to use the existing masonry openings to the greatest extent possible.
   a. Exposed concrete coring: Notify Contractor of exact locations and sizes for all openings required in exposed concrete, to be executed under Section 03 3000 – Cast-in-Place Concrete.
   b. Concrete coring less than 6 inches: Any new penetration cut through existing concrete less than 6 inches in width shall be executed by the specific Trade(s) installing the work.
   c. Concrete coring 6 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 6 inches in diameter required in concrete, to be executed under Section 03 3000 – Cast-in-Place Concrete.
   d. Masonry openings less than 6 inches: Any new penetration cut through existing masonry less than 6 inches in width shall be executed by the specific Trade(s) installing the work. .
   e. Masonry openings 6 inches or larger: Notify Contractor of exact locations and sizes for openings larger than 6 inches in width required in masonry, to be executed under Section 04 2113 – Brick Masonry, utilizing lintels, furnished per Section 05 5000 – Miscellaneous Metals.
   f. Exposed gypsum board: Notify Contractor of exact locations and sizes for all openings required in exposed gypsum board, to be executed under Section 09 2900 – Gypsum Board Assemblies.

g. Concealed gypsum board: Any new penetration cut through existing or new concealed gypsum board less than 6 inches in width shall be executed by the specific Trade(s) installing the work. Cutting and patching larger than 6 inches in diameter, or 6 inches by 6 inches to be executed under Section 09 2900 – Gypsum Board Assemblies.
h. All cutting shall conform to the requirements of this SECTION.

END OF SECTION

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SECTION 23 00 01
HEATING AND VENTILATING

Contents

SECTION 230001

HEATING, VENTILATING, AIR CONDITIONING

(FILED SUB BID REQUIRED)

PART 1: GENERAL

1.01 GENERAL PROVISIONS

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

C. Examine all Drawings and all Sections of the Specifications and requirements and provisions affecting the work of this Section.

1.02 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS

A. Sub-bids shall be submitted in accordance with provisions of the Massachusetts General Laws, Chapter 149, Section 44A to 44L, inclusive, as amended. The time and place for submission of Sub-bids are set forth under the Advertisement. Procedures and requirements for submitting Sub-bids are set forth in the Instructions to Bidders.

B. Sub-bidders must be DCAMM Certified in the listed trade and shall include a current DCAMM Sub-bidder Certificate of Eligibility and a signed DCAMM Sub-bidder's Update Statement with the bid.

C. Work to be done under this SECTION is shown on Contract Drawings numbered HD-1, HD-2, HD-3, HD-4, H-0, H-1, H-2, H-3, H-4, H-5.

D. Remaining Contract Drawings are included for reference and coordination; Each Sub-bid filed with the Awarding Authority must be accompanied by BID BOND, CASH, or CERTIFIED CHECK, or a TREASURER'S CHECK or CASHIER'S CHECK, issued by a responsible bank or trust company, payable to the Town of Boxford in the amount stipulated in the INSTRUCTIONS TO BIDDERS. A Sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

E. Sub-subs: Sub-sub bids are not required for this Section. Paragraph E of the Form for Sub-bid shall be left blank or marked N/A.

F. Each Sub-bid submitted for the work, under this SECTION, shall be on a form furnished by the Awarding Authority, as required by SECTION 44F of Chapter 149 of the General Laws, as amended.

G. 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	REFERENCE PARAGRAPH
Balancing	230001 – 3.13, 3.14
Duct Insulation	230001 – 2.11, 2.12
Pipe Insulation	230001 – 2.12
Sheet Metal (Ductwork)	230001 – 2.08, 2.09
Automatic Temperature Controls	230001 – 2.32, 3.06

1.03 DEFINITIONS

A. The "Owner" shall be The Town of Boxford, Massachusetts, or it's representative.

B. The "Architect" shall be Gienapp Architects, LLC.

C. Northeast Engineering and Commissioning Services, Inc. shall be considered the "Designer".

D. Work shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for proper and complete installation.

E. Concealed shall mean hidden from sight in chasses, furred in spaces, shafts, embedded in construction and in a crawl space.

F. "Furnish" shall mean purchase and delivery to the project site, complete with every necessary appurtenances and support.

G. "POS" means "Provided Under Other Sections"

H. "Install" shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting, proper location and correct operation in the project.

I. "Provide" may be used in place of "furnish and install" and where used, shall mean to deliver, furnish, install, erect and connect up complete, in readiness for regular operation, the particular work or equipment referred to, unless otherwise specified.

J. "Piping" shall mean, in addition to pipe or tubing, all fittings, flanges, unions, valves, strainers, drains, hangers and other accessories relative to such piping.

K. "Coordinate" shall mean all work provided under this section of the specifications shall be in compliance the requirements of the Owner.

L. "HVAC", or "ATC Contractor", or shall be the contractor responsible for the work of this section of the specifications.

M. "HVAC Drawings", "Mechanical Work" shall mean the work shown on the HD-1 thru HD 4, H-0 thru H-5, drawings and HVAC work as defined herein.

1.04 WORK INCLUDED

A. The scope of the HVAC Renovation work shall consist of the installation of all materials to be furnished under this section 23 00 01, Drawings HD-1, HD-2, HD-3, HD-4, H-0, H- 1, H-2, H-3, H-4, H-5 and without limiting the generality thereof, consists of furnishing all labor, materials, equipment, plant, transportation, rigging, staging, appurtenances, and services necessary and/or incidental to properly complete all work as shown on the Heating Ventilating and Air Conditioning drawings, as described in the specifications, or as reasonably inferred from either, in the opinion of the Designer.

B. The work shall include but not be limited to furnishing and installing the following:

1. Demolition and disposal off site of existing equipment, piping, thermostats and controls as defined in SECTION 1.28 below.
2. Disconnect and reinstallation of HVAC equipment temporarily interrupted during construction.
3. Removal and disposal off site of existing remote air-cooled condensing units, air handling units, ductwork, insulation and controls as shown on the plans.
4. Temporary heating
5. Duct cleaning.
6. Remove existing registers, grills and diffusers.
7. Furnish and install new registers, grills and diffusers.
8. Refrigerant piping.
9. Hot water heating piping.
10. Condensate piping
11. Ductwork
12. Humidifiers
13. Humidifier drain piping
14. Hangers and supports
15. Variable refrigerant flow condensing units fan coil units in ceilings and in Attic.
16. Split system condensing units as shown on the plans.
17. Secondary drain pans
18. Hot water unit heaters and miscellaneous heaters.
19. Exhaust fans.
20. Energy recovery ventilators
21. Direct expansion cooling/heating coils.
22. Variable refrigerant flow heating/cooling condensing units
23. Starters for the HVAC equipment
24. Insulation.
25. Humidifier water filter system
26. Louvers for intake and exhaust shall be furnished and installed under this contactor's work.
27. Automatic temperature controls to provide a complete and operable system for all the new HVAC equipment.
28. All seismic restraints and supports.
29. Balancing of air and water systems shall be part of the scope of work for the HVAC Contractor.

30. Commissioning shall not be part of the work of this section of the specifications. Coordination and assistance to the Commissioning Agent for the commissioning of the HVAC systems shall be part of the scope of work for the HVAC Contractor. The coordination shall include the availability and manpower of the HVAC Contractor, the Automatic Temperature Control contractor and the Balancing Contractor. Systems commissioning shall be in accordance with the Ninth Edition of the Massachusetts State Building Code 780 CMR Section 503.2.9 Mechanical Systems Commissioning and Completion Requirements.
31. All required cutting and patching.
32. All required equipment supports.
33. All concrete bases shall be furnished and installed under Section 03 3000 of the specifications.
34. Stenciling and tagging of piping and valves.
35. All appurtenances necessary for system operation and controls.
36. Furnishing all hoisting, rigging and staging required for the work of this section.

C. The HVAC Contractor shall obtain all required permits There are no permit fees for this project.

1.05 SUBMITTALS

A. Samples: Submit duplicate samples of each material under this Section requested by Designer to Designer for approval. Samples shall be in size and form requested by Designer, and reasonable to show characteristics, colors, and finishes of the materials.

B. Product Data: Submit six sets of complete manufacturer's product data of all materials and systems under this Section to Designer for approval. Product data shall show the specific product or material being submitted clearly marked with all specified accessories. Product data shall consist of manufacturer's complete product data, complete preparation and installation instructions, safety precautions, and other pertinent technical data require for complete product and product use information.

C. Activity Schedule: Submit schedule of work clearly defining the start and completion dates for all work on the project.

D. Do not order materials or begin installation work of this Section until Designer's approval of submittals has been obtained.

E. Shop Drawing: Submittals shall include but not be limited to:

1. Variable Refrigerant Flow condensing units and fan coil units
2. Air cooled condensing units
3. Refrigerant cooling coils
4. Hot water heating coils
5. Condensate piping
6. Humidifier drain piping
7. Air handling units.
8. Energy recovery units
9. Exhaust fans
10. Humidifiers
11. Humidifier water filters

12. Hot water unit heaters
13. Louvers
14. Direct expansion cooling coil
15. Ductwork
16. Automatic controls.
17. Insulation
18. Vibration isolators.
19. Motor starters.
20. Pipe, pipe hangers, sleeves and inserts.
21. Equipment bases and supports.
22. Motors.
23. Access panels.

F. Hanger Pull-Out Testing Submittals and Requirements: Hangers and supports will be tested for pull-out by the Independent Testing Agency.

G. 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.

1.06 CONTRACT DOCUMENTS

A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, Electrical, HVAC and Structural, and other Drawings 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.

1.07 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, the HVAC 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.

1.08 MODIFICATIONS IN LAYOUT

A. HVAC drawings are diagrammatic. They indicate general arrangements of HVAC 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 the HVAC drawings for locations and where not definitely indicated, request information from Designer.

C. Check Contract Drawings as well as Shop Drawings of all Sub-contractors 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, 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.

1.09 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.

1.10 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. International Mechanical Code 2015
3. International Energy Conservation Code 2018
4. American Gas Association (AGA).
5. National Fire Protection Association (NFPA).
6. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
7. Occupational Safety and Health Act (OSHA).
8. 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:

1. American National Standards Institute (ANSI).
2. American Society of Mechanical Engineers (ASME).
3. National Electric Manufacturers Association (NEMA).
4. American Society for Testing and Materials (ASTM).
5. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
6. Air Moving and Conditioning Association (AMCA).
7. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
8. American Diffuser Council (ADC).
9. Air Conditioning and Refrigeration Institute (ARI).
10. Thermal Insulation Manufacturers Association (TIMA).
11. Institute of Electrical and Electronics Engineers (IEEE).
12. Insulated Cable Engineers Association (ICEA).
13. NFPA 54, National Fuel Gas Code 2012.

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 GENERAL CONDITIONS and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in The Owner’s name.

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 The Owner. Service can be provided by the HVAC Contractor or a separate service organization. Choice of service organization shall be subject to Designer and Owner’s. 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 The Owner.

G. This Paragraph shall not be interpreted to limit The Owner’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 Owner 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. The HVAC contractor shall provide record drawings on AutoCad 2016 or latter to the Designer for review at the end of the project as a condition of final payment to the HVAC contractor.

B. 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 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. Variable Refrigerant Flow System, Duct mounted hot water and refrigerant coils, fans, humidifiers, etc. Sequence shall list switches, and other devices used to start, stop and control system. Detail procedure to be followed in case of malfunctions.

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 Owner's personnel to become familiar with equipment and operation prior to acceptance.

C. Operating instructions: Upon completion of installation or when The Owner 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. The Owner 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.

D. 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.

E. 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

A. The HVAC contractor shall report to the Owners Project Manager (OPM) and Designer of any conflicts or issues that may affect the demolition or temporary removal and replacement of the existing system, piping, ductwork, controls or insulation. The HVAC contractor shall also notify the OPM and Designer of conflicts or issues affecting the new systems installation of the new system, piping, ductwork, controls or insulation.

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 of the building will permit and must be installed promptly when and as required.

C. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any conflicts shall be referred immediately to the Owner for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Owner's satisfaction at no expense to the Owner.

1.15 CERTIFICATES OF COMPLIANCE

A. The entire system hall be tested and approved in accordance with local regulations and as specified herewith. The Contractor shall furnish all certificates of compliance in triplicate to the Designer. The Contractor shall furnish all instruments, ladders, test equipment, and personnel required for the tests, and shall dispose of all test and wastewater.

B. All equipment shall be like approved for the service intended.

1.16 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in undamaged condition in original, factory-sealed containers, clearly labeled with manufacturer’s name and product identification.

B. Materials shall be stored in a protected and safe area as determined by the Owner.

1.17 STANDARD OF QUALITY

A. Equipment, materials and specialties shall be manufactured by nationally recognized organizations of at least five (5) years standing and reputation of producing top quality products.

B. In the event any product specified to be installed is superseded by an update or more recent equipment generation the HVAC contractor shall notify the OPM and the Designer. The notification shall include any changes to installation requirements, and services necessary for the equipment to be maintained and operate properly.

C. INSPECTION OF SITE CONDITIONS

D. Prior to submission of bid, visit the site and review the related construction documents to determine the conditions under which the Work must be performed. Send a report, in writing, to the Designer, noting any conditions which might adversely affect the Work of this Section of the Specifications.

1.18 SURVEY AND MEASUREMENTS

A. Base all required measurements, horizontal and vertical, from referenced points established by the HVAC Contractor 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 Designer or Owner in writing and do not proceed with the related work until instructions have been issued.

1.19 PROTECTION OF WORK AND PROPERTY

A. The HVAC Contractor shall be responsible for the care and protection of all work included under this Section until the completion and final acceptance of this Contract.

B. Protect all equipment and materials from damage from all causes including, but not limited to, fire, vandalism and theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no additional cost to the Owner.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this Section and make good damage thus caused.

D. Damaged materials are to be removed from the site; no site storage of damaged materials will be allowed.

1.20 SUPERVISION

A. Provide a job-site Superintendent with a minimum of 5 years of experience in Mechanical Construction Supervision who shall be responsible for the installation of the Work of this Section of the Specifications, and in accordance with this Section of the Specifications and with the Contract Drawings.

1.21 SAFETY PRECAUTIONS

A. Life safety shall be a primary consideration. Provide all required and prudent material, labor and equipment to comply with applicable safety regulations. Further, provide all material, labor and equipment to comply with reasonable or generally accepted safety precautions as directed by the Owner or the Designer.

B. Comply with all the safety requirements of 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. Note that portions of the building will remain occupied throughout the Construction Contract. Take no action which will obstruct, disturb or distract the Owner or users of the facility. Provide all measures as required by Designer to mitigate the effects of the construction on occupied areas.

F. Also refer to the GENERAL CONDITIONS

1.22 SPARE PARTS

A. Furnish spare-parts data for each different item of equipment furnished. The data shall include a complete list of parts and supplies, with current unit prices and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified hereinafter to be furnished as part of the contract; and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 180 days at the particular installation. The foregoing shall not relieve the HVAC Contractor of any responsibilities under the guarantees specified herein.

1.23 MAINTENANCE ACCESSORIES AND TOOLS

A. All special tools necessary as recommended by the equipment manufacturer for the operation and maintenance of new equipment shall be furnished. Small hand tools shall be furnished with a suitable lockable cabinet, mounted where directed.

1.24 CUTTING AND PATCHING

A. Provide all cutting and patching necessary for the proper installation of work to be performed under this Section.

B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.

C. Form all chases or openings for the installation of the work of this Section of the specifications or cut the same in existing work and see that all sleeves or forms are in the work and properly set in ample time to prevent delays. Be responsible that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and consult with the Designer, Owner and the Sub-contractors concerned about this work. Confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the approval of the Designer.

D. Fit around, close up, repair, patch, and point around the work specified herein to match the existing adjacent surfaces and to the satisfaction of the Designer.

E. Fill and patch all openings or holes left in the existing structures by the removal of existing equipment which is part of this Section of the Specifications.

F. All of this work shall be carefully done by workmen qualified to do such work and with the proper and smallest tools applicable.

G. Any cost caused by defective or ill-timed work required by this Section of the specifications shall be borne by the HVAC Contractor.

H. When, in order to accommodate the work required under this Section of the specifications, finished materials of other trades must be cut or fitted, furnish the necessary drawings and information to the trades whose materials must be cut or fitted.

1.25 CORING AND DRILLING

A. All pipe holes in structure shall be either cored or drilled. The HVAC Contractor shall furnish all coring and drilling required for the installation of his work. Prior to coring, drilling or making any other opening in the building structure the HVAC contractor shall notify the Owners Project Manager.

1.26 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

A. General Provisions

1. Attention is directed to the GENERAL CONDITIONS and all sections within which are hereby made a part of this Section of these Specifications.

B. Requirements

1. Hoisting Equipment and Machinery
2. Staging
3. Dust Control
4. Ventilation Requirements

5. Noise Control

C. Hoisting Equipment and Machinery

1. 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 HVAC Contractor. All costs for hoisting operating services shall be borne by the HVAC Contractor unless specifically excluded in the Contract Documents.

D. Staging

1. All staging, exterior and interior, required to conduct the HVAC work, shall be furnished and erected by the HVAC Contractor and maintained in safe condition by him.

E. Dust Control

1. The HVAC Contractor shall provide adequate means for the purpose of preventing dust caused by construction operations throughout the period of the construction contract.

2. 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 HVAC Contractor.

3. The HVAC Contractor shall take steps to prevent the introduction of pollutants and dust into the ventilation system during construction, and completely clean all ductwork and equipment which becomes visibly contaminated due to the work of this project.

4. All ductwork to be reused shall be sealed to prevent dust from entering.

5. All unit heaters, fin tube radiation and convectors used or in place within the work areas during construction shall be completely cleaned, including the coils and fins, prior to turning over the project to the Owner.

F. Ventilation Requirements

1. In all areas where demolition and or construction occur under this contract, the HVAC Contractor shall enclose the space and the HVAC Contractor shall provide exhaust ventilation so as to provide a negative pressure within the enclosed space for the purpose of preventing dust to escape from the enclosure. Exhaust shall be approximately 1 CFM per square foot (adjustable).

G. Noise Control

1. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

2. Execute construction work by methods and by use of equipment which will reduce excess noise.

   a. Equipment air compressors with silencers, and power equipment with mufflers.

   b. Manage vehicular traffic and scheduling to reduce noise.

H. Enclosures

1. Provide temporary partitions and ceilings as required to separate work areas from the Owner's occupied areas, to prevent penetration of dust and moisture into Owner's 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; RSTC rating 35 in accordance with ASTM E901. (Flame Spread Rating of 25 in accordance with ASTM E84) Paint surfaces exposed to view in Owner's occupied areas.

1.27 HEATING DURING CONSTRUCTION

A. Within 30 calendar days after the commencement of work under this Contract, the HVAC Contractor shall submit in writing to the Designer and owner for approval, three copies of his method and time schedule for heating and cooling the building during construction which shall concur with his general progress schedule hereto before submitted as required under Article V of the CONTRACT AND GENERAL CONDITIONS.

B. Substantial completion of the project will require that no later than the specified substantial completion date all HVAC equipment shall be operational and able to heat and cool the building. It shall be the sole responsibility of the HVAC Contractor to arrange for and pay the HVAC and/or Electrical Contractor to operate and to put in first-class condition all portions of the permanent heating system used for heating during construction. The Town of Boxford will require the discharge of inexperienced or unsatisfactory operating labor.

C. If the HVAC equipment is not able to heat the building by the substantial completion date temporary heating units shall be furnished and installed to provide heating. The HVAC Contractor shall pay and provide heat therein of not less than 72 degrees F. degrees in the Town Hall/Library, which shall be continuously maintained in the until the project is accepted.

D. The HVAC Contractor shall furnish and install one accurate recording Fahrenheit thermometer at a place designated by the Designer, and one additional accurate thermometer for every 2,000 square feet of floor space, located as directed by the Designer in order to determine if the specified temperatures are maintained. The HVAC Contractor or his authorized agent shall furnish daily to the Owner three copies of a signed statement of temperatures recorded every three hours.

E. The HVAC Contractor, with the approval of the Designer and the Owner, may use the permanent heating and cooling systems as specified for the project once it has been tested, thoroughly cleaned of all construction dust and dirt, and is ready to operate. The HVAC Contractor and the HVAC and/or Electrical Contractor shall coordinate their work so that the permanent heating and cooling systems for the buildings will be available and ready to provide heat and cool as soon as the date of substantial completion or earlier.

F. Operating labor shall be provided for continuous direct attendance, for frequent inspection of the system, emergency repairs, and keeping of temperature records. Continuous direct attendance shall mean direct attendance for twenty-four hours each day, seven days per week, Saturdays, Sundays and holidays included, throughout the progress of the work.

G. The installation and operation of heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection. Heating devices which may cause damage to finish surfaces shall not be used.

1.28 DEMOLITION

A. In General demolition shall include but not limited to disconnecting, capping and otherwise making inactive existing HVAC systems and services shall be done in areas

where demolition and removal work is required. HVAC tradesmen, under this section shall disconnect, cap, inactivate and lower to the floor such items where required to be removed. The HVAC Contractor shall remove demolished and removed material that has been left on the floor and dispose of off-site in a legally and environmentally acceptable location.

B. The existing cooling and heating air handlers in the Attic and condensing units at grade on the side off the building shown hatched on the demolition drawing are to be removed. The existing HVAC unit shall be pumped down, the refrigerant reclaimed and turned over to the owner. If the owner chooses not to accept the reclaimed refrigerant, then the refrigerant and refrigerant system oil shall be disposed of in a manner that is in accordance with federal, state and local regulations. The existing HVAC equipment is to be removed from the site and disposed of in accordance with federal, state and local codes

PART 2: PRODUCTS

2.01 MANUFACTURERS, EQUIPMENT AND MATERIALS

A. Equipment, materials and specialties shall be manufactured by nationally recognized organizations of at least five (5) years standing, each with a reputation of producing top-quality products in accordance with all applicable codes, standards, rules and regulations as most recently issued.

2.02 PIPING SYSTEMS

A. Refrigerant Piping:

1. Pipe: Type L ACR hard drawn copper, ASTM B88.
2. Joints: Brazed or silver soldered.
3. Joints: Silver solder, minimum 45% silver brazing alloy, cadmium free, ASTM B32.

B. Heating Hot Water:

1. Pipe: Seamless steel; ASTM A53 or A106, Grade A or B; Schedule 40.
2. Fittings: For pipe size 2-1/2 inches and above - steel, beveled butt-weld ends, ASTM A234, Grade B, ANSI B16.9, same schedule as adjoining pipe, all elbows long radius, all interior surfaces smoothly contoured. For pipe sizes 2 inches and below - threaded ends, 150 pounds malleable iron ANSI B16.3.
3. Unions: On pipe sizes 2 inches and under, 300-pound malleable iron; ground ball joint; all iron seats; ANSI B16.39.
4. Joints: Welded for pipe 2-1/2 inches and above, threaded or welded for pipe sizes 2 inches and below.
5. Flanges: Weld neck, ANSI B16.5, forged steel, ASTM A105. Pressure class 150 pounds or to match class of adjacent valves. Provide asbestos free gaskets with applicable bolt pattern for all flanged connections.

C. Equipment Condensation Drain Piping:

1. Pipe: Schedule 40 PVC or Type L copper tubing.
2. Fittings: DWV pattern; for galvanized pipe - galvanized malleable iron, threaded; for copper pipe wrought copper ANSI B16.22, joints to be made with 95/5 solder, ASTM B32; for PVC Pipe - PVC, ASTM D2665 and D3311, joints solvent welded, ASTM D2564.

D. Gaskets

1. One piece, 1/16" thick, Garlock Blue-Gard Type 3100, Manville, Parker Hannifin or equal, non-asbestos composition.

E. Dielectric Unions and Flanges

1. Factory certified to withstand a minimum of 600 volts on a dry line with no flashover, rated 250 PSIG and conforming to ANSI B-16.39.
2. Dielectric union and flange pipe threads: in accordance with ANSI B2.1.
3. Solder joints: per national plumbing standards.
4. Dielectric unions and flanges: as manufactured by Watts, Epco, Dart or equal.
5. Provide dielectric unions and/or flanges at all connections of dissimilar piping materials.

F. Air Vents

1. Air vents shall be installed at all high points of the water systems, end of mains, where shown on the Drawings and as required. Air vents shall be Hoffman #78 automatic float type air vent with 150 PSI working pressure, 1/8" safety drain connection, ball check, cast brass construction, copper clad steel float.

2. Provide 1/8" needle valve in 1/8" safety drain piping from each vent to nearest drain. Locate needle valve at vent where vent is accessible.

2.03 PIPE SLEEVES AND SEALS

A. All pipes passing through outside walls shall be provided with sleeves having an internal diameter a minimum of two inches (2") larger than the outside diameter of the pipe or conduit passing through the sleeve.

B. Sleeves through outside walls shall be Schedule 40 black steel pipe with a 150-pound black steel slip on welding flange, welded at the center of the sleeve and shall be painted with one coat of bitumastic paint, inside and outside. As an alternate, provide factory-fabricated wall sleeves with integral water stops; coating to be as indicated above.

C. The sleeves through outside walls shall be provided with pipe-to-wall penetration closures. Seals shall be Mechanical type of interlocking rubber links shaped to fill space between pipe and sleeve. Links shall be assembled with bolts to form a belt around the pipe with pressure plate under each bolt head and nut. After seal assembly is positioned, tightening of bolts will provide watertight seal. The HVAC Contractor shall determine the required inside diameter of each individual sleeve before ordering, fabricating or installing. The inside diameter of each sleeve shall be sized as recommended by the manufacturer to fit the pipe and to assure a watertight joint.

D. Sleeves through walls shall terminate flush with face of wall.

E. Sleeves shall be furnished and installed by The HVAC Contractor shall be responsible for determining size and number of sleeves required, and for location of sleeves.

2.04 VALVES AND STRAINERS

A. Valves on hot water (2" and smaller) piping shall be 125 psi unless noted otherwise. Pressure ratings of valves 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.

C. Provide butterfly valves for shutoff on 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 shall have seven position lever operators.

3. Test valves at 110% of rated pressure.

D. Provide full port bronze body ball valves with reinforced teflon seats, seals, bearings and packing. Ball valves shall be used for 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 Crane, Apollo, Nibco, Milwaukee, or Watts. Valves shall be rated 600 psi wog.

E. 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 pump discharge shall be spring loaded, silent check, by APCO, Milwaukee, Mueller or Stockham.

F. 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.

G. 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.

H. Provide full port ball blow off valve with threaded hose connection, cap & chain on each strainer.

I. Strainer gaskets shall not contain asbestos.

J. 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.

K. Provide unions for threaded end valves to facilitate removal from pipe.

2.05 COMBINATION BALANCING/FLOW MEASUREMENT/SHUT-OFF VALVES

A. Provide balancing/flow measurement/shut-off valves where specified herein, shown on the drawings and details.

B. Combination balancing, flow measurement and shut-off valves shall be installed on all new branch piping take-offs, hot water coils, and unit heaters.

C. Valves shall be Y-pattern style with multi-turn hand wheel.

D. Valves shall be capable of being installed in any direction without affecting flow measurement and shall provide the following functions:

1. Precise flow measurement.
2. Precision flow balancing.
3. Positive shut-off with no drip seat.
4. 3/4" drain port suitable for hose bib fitting. (Sizes 2" and below.)

E. 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"). Handwheels shall have digital indicators with hidden memory and tamper-proof setting features.

F. Valves 2" and below shall be non-ferrous, pressure die-cast, non-porous Ametal copper alloy, with soldered ends.

G. 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.

H. Pressure ratings shall be 300 psi for 2" and below and 250 psi for flanged and 300 psi for grooved ends.

I. Each valve shall have pressure/temperature readout ports with EPDM seals and attached shut-off valves.

J. One, computerized hand-held, balancing meter shall be furnished to the Owner Project Manager. The Testing and Balancing Contractor shall utilize this instrument for his work. The meter shall include the following:

1. Flow measurement direct in GPM.
2. Differential pressure measurement.
3. Temperature measurement.
4. Automatic calibration.
5. Automatic air purging.
6. Extended data logging functions.

K. Balance valves 2" and under shall be Tour and Anderson Model STAD as standard. Valves 2-1/2" and over shall be Tour and Anderson Models STAF-SG as standard. The handheld meter shall be Tour and Anderson Model CBI as standard with PCB data logging features. Balance valves manufactured by Armstrong or Victaulic shall be considered equivalent.

2.06 GAUGES AND THERMOMETERS

A. Pressure Gauges

1. Up to 7 feet above finished floor: 4½" diameter; over 7 feet above finished floor: 6" diameter, oriented for ease of reading.
2. Provide gauges having one percent of scale range accuracy, brass pipe and fittings, phosphor bronze bourdon tubes, beryllium copper bellows, 1/4-in. NPT male connection, stainless steel rack and pinion movement, micro adjustment for calibration, white dial and black figures, plastic lens, and threaded ring case. Provide minimum 2-inch long brass nipples, test cock, snubbers and shutoff-cock for each gauge.
3. Gauge ranges to be selected so that normal operating range for a particular gauge will occur at approximately the midpoint of the total range, and so that under minimum and maximum conditions, damage to gauge shall not occur. .
4. Gauge Schedule: Provide at locations indicated on drawings. Shop drawing submittal package to include location, size of gauge and range.
5. Manufacturers: Ashcroft, U.S. Gage, Marsh or equal.
6. Gauges on piping in the Attic shall be so placed as to be easily read from the floor without parallax.

B. Thermometers and Wells

1. Separable well type, industrial thermometers as manufactured by Taylor Instrument Co., U.S. Gage, H.O. Trerice, or equal.
2. Provide thermometers having brass, cast aluminum-bronze or cast aluminum case with blue reading non-mercury and glass windows or dial type bi-metal reading unit with stainless steel case, glass window and external adjustment. Provide 3-inch diameter white dials or 9-inch scales with black numbers and adjustable angle stem, brass separable wells with extended neck to suit insulation thickness. Provide stems and wells to extend approximately to center of the pipe or maximum length of 12-inch for large pipe. Provide 1 percent accuracy at mid-range.

System	Scale:
Hot Water:	30-300ºF.

2.07 PIPE HANGERS AND SUPPORTS

A. As manufactured by Carpenter & Patterson, Inc., Grinnell Corporation, B-Line Systems or equal. Hangers shall transmit the load exclusively to the structure of the building. All hangers and supports to conform to MSS standards SP-58 and SP-69 and ANSI B 31.1.

B. Hangers for all piping 4 inches and above shall be adjustable roll type. Hangers for piping below 4 inches shall be clevis type. Hangers for piping on strut support frames shall be roller type, similar to Fig. B379 by B-Line Systems. Additionally, the first two (2) pipe hangers on both sides of all pump piping (suction and discharge) to be pre-compressed spring and double-deflection neoprene style, with 30° hanging rod swing capability, similar and equal in all respects to Mason Industries Model PC 30N, selected by manufacturer for anticipated loading and deflection. (See Paragraph 2.15)

C. Provide all additional structural steel required for proper installation of hangers, anchors, guides and supports; hangers shall be arranged to maintain the required grading and pitch of piping, to prevent vibration and to provide for expansion and contraction.

D. Maximum spacing of hangers and supports:

1. For Copper Pipe and Tubing:

Pipe Size (inches)	Spacing (feet)
Up to 1/2	4
5/8 or 3/4	6
7/8 to 3	8

2. For PVC and CPVC pipe:

Pipe Size (inches)	Spacing (feet)
Up to 1/2	2.5
¾	2.5
1	2.5
1-1/4	3-
1-1/2	3

3. For Steel Pipe:

Pipe Size (inches)	Spacing (feet)
Up to 1	6
1-1/4 to 2-1/2	9
3 to 6	10
8 and up	10

E. All exterior pipe hangers, threaded rod, and supports shall be either hot dip galvanized after fabrication, PVC coated, stainless steel, or a combination thereof to provide complete corrosion resistance.

F. Branch piping and runouts of over 5 feet shall have at least one hanger or support.

G. At all copper piping, provide pipe supports with copper finish to eliminate the possibility of galvanic action.

H. Furnish additional hangers or supports at vertical or horizontal changes of direction and at locations of concentrated loads due to valves, fittings, strainers, and accessories.

I. Hangers and supports shall provide for 2" of vertical adjustments.

J. Hanger rods shall be steel, threaded and furnished with two removable nuts at each end of positioning rod and hanger and locking each in place.

K. Except as otherwise noted, hanger rods shall be of the following sizes:

SCHEDULE OF PIPE HANGER ROD SIZES

Pipe sizes (inches)	Single rod diameter (inches)	Double rod diameter (inches)
½-2	3/8	3/8
2½-3	½	3/8
4&5	5/8	½
6	3/4	5/8

L. Pipe covering protection saddles shall not be loaded to more than 80% of maximum loading as rated by the manufacturer.

M. Insulated piping insulation shields:

1. Up to 3" pipe size: 18-gauge galvanized steel, located outside the vapor barrier, minimum 180° arc, 12" long, or pipe covering protection saddles.
2. 4" pipe size and larger: pipe covering protection saddles.
3. Vertical support shall be by means of riser clamps (anchors with split ring type allowable up to 2" size only) and adjustable pipe support with flange anchored to floor.
4. Rods, clamps and hangers shall be electro galvanized coated.

J. Upper attachments to Building Structure:

1. Structural Steel Framing: Upper attachments welded or clamped to structural steel members. Additional steel members may be necessary in some support locations where piping locations differ from that known on contract drawings. Submit details for approval.
2. Expansion Fasteners and Power Set Fasteners: In concrete slab construction, expansion fasteners may be used for hanger loads up to one-third the manufacturer's rated strength of the expansion fastener. Power set fasteners may be used for loads up to one-fourth of rated load. When greater hanger loads are encountered, additional fasteners may be used and interconnected with steel members combining to support the hanger.

2.08 DUCTWORK

A. Sheet metal ductwork shall be galvanized steel, except where noted, smooth inside and true to size. Duct construction, gauges, specifications and supports shall be in accordance with recommendations of the latest edition of SMACNA Duct Construction Standards. No standards for ductwork other than SMACNA shall be accepted.

B. Sheet metal ductwork, dampers, access doors, slips and fasteners a distance of 10 feet down stream of the steam humidifiers shall be Aluminum, smooth inside and true to size. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

C. The duct pressure class shall be as follows: All new supply ductwork shall be 2"water gauge pressure class. All new return ductwork shall be 2" pressure class. All new exhaust ductwork shall be 1" water gauge pressure class.

D. In addition, all joints and all seams of all ductwork shall be sealed with UL labeled sealer as manufactured by 3M Company or United Steel Metal equal to 3M EC-900.

E. Sheet metal elbows shall have a radius of 1½ times the duct width measured by duct centerlines. Where conditions will not permit or where indicated on drawings use miter turns with double wall turning vanes. Provide air splitter dampers where indicated on the drawings and where required for adjustment of air distribution to respective duct branches. Splitter dampers shall be constructed in accordance with applicable SMACNA Standards.

F. Provide factory fabricated volume dampers in all supply, return branch ducts, at each rectangular diffuser and linear diffuser and where indicated on drawings. Volume dampers shall be multi-blade in ducts 24" wide and larger constructed in accordance with applicable SMACNA Standards.

G. After and during assembly of ducts, clean all dirt, grease, rubbish, etc. from both the interior and exterior of ductwork.

H. When ductwork is stored on site, all ducts shall be tightly covered to keep inside of ducts clean and free from dust.

I. After installation ductwork shall be tested following a procedure as hereinafter specified. Where specified compound in used, ductwork shall not be subject to air pressure for a period as recommended by the manufacturer but at least 48 hours after assembly.

J. Where ducts are insulated, provision shall be made for a neat installation finish around damper operator quadrant. Test openings, access doors and similar operation devices. A metal collar equivalent in depth to the insulation may be finished shall be mounted on duct.

K. Rigid round, rectangular and flat oval metal ductwork shall be installed with support systems indicated in tables 4-1 to 4-3 and Figures 4-1 to 4-10 of the 1995 SMACNA HVAC Duct Construction Standards Metal and Flexible Second Edition -1995.

L. The HVAC contractor shall, as part of his work, attach the ductwork to the steel supports and provide all required drilled holes in the steel angles, supplemental steel supports and hardware.

M. All interior duct work and equipment shall be supported from the top cord of joists or trusses.

2.09 SHEET METAL ACCESS DOORS IN DUCTWORK AND CASINGS

A. Provide where necessary in ductwork or casings, suitable access doors and frames to permit inspection, operation and maintenance of all controls, filters, bearings, or other apparatus concealed behind the sheet metal work. All such doors in insulated ducts to be double panel insulated of not less than 20 gauge. Access doors in uninsulated ducts may be of single panel construction of aluminum and shall have sponge rubber gaskets around their entire perimeter. Where duct size permits minimum access door shall be 16 x 16.

2.10 ACCESS DOORS AND FRAMES IN BUILDING CONSTRUCTION

A. Furnish access doors and frames for access to all concealed parts of the systems of this Section that require accessibility for the proper operation, maintenance and inspection of the system.

B. All Access Doors shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that the accessible components of the systems of this Section can be easily reached, and the size shall be sufficient for this purpose. When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

C. Provide access door to match rating of the assembly into which it is installed.

D. Access doors shall be prime painted and equipped with screwdriver operated cam locks.

E. Access doors and frames shall be furnished by this SECTION to the General Contract for installation by the SECTION installing the construction into which the panel is located.

F. Access doors and frames shall comply with the requirements of Section "Access Doors and Frames"

2.11 INSULATED FLEXIBLE DUCT

A. Flexible duct shall be triple lock thermal insulated flexible duct or approved equal. The flexible duct shall consist of a core of triple lock metal flexible ducting. This shall have applied at the factory a U.L. listed glass or mineral wool insulating blanket. The blanket shall be sheathed in a U.L. approved seamless exterior aluminized covered jacket. The complete duct assembly shall conform to the amended standards of NFPA 90A and shall have been tested and listed by Underwriters Laboratories as a U.L 181 class 1 air duct.

B. The maximum length of flexible duct shall be 5 feet.

2.12 INSULATION

A. All supply return and exhaust air ductwork inside the building shall be insulated with to 2" thick foil faced fiberglass duct wrap, 1-1/2 lb. Density, the minimum installed R value for the duct insulation shall be 6. Insulation shall be Knauf Atmosphere duct wrap or approved equal, tape all joints with foil duct tape.

B. All refrigerant suction and hot gas piping inside the building shall be insulated with Knauf Earthwool 1000° one-piece fiber-glass insulation or approved equal and finished with a factory applied, self-sealing, pre-sized "ASJ" all service vapor barrier jacket. Insulation thickness for refrigerant piping 1.5" and smaller shall be 1". The thermal conductivity of the insulation shall be 0.21- 0.27 BTU per inch/hour per square foot per degree Fahrenheit. Insulation All Service Jacket shall be sealed at butt ends with manufacturer supplied butt strips. Piping outside of the building shall be insulated with closed cell foam pipe insulation 1 ½" wall as necessary to meet the above thermal conductivity requirement. Exterior closed cell foam insulation shall be coated with closed cell foam protective coating. Closed cell foam insulation shall not be installed by slitting and taping but slipped over the pipe, ends butted together and glued.

C. All outdoor air intake ductwork shall be insulated with Earthwool Insulation Board or approved equal. 3" thick, 3-pound density, rigid board fiberglass insulation with vapor barrier. The minimum R value of the insulation shall be 13. The board insulation shall be clad with a foil scrim jacket All joints of the cladding shall be sealed with tape made of the same material as the cladding. Cladding and tape shall be as approved by the manufacture of the insulation.

D. All ductwork installed outside the building shall be insulated with Earthwool Insulation Board or approved equal. 3" thick, 6-pound density, rigid board fiberglass insulation with vapor barrier. The minimum R value of the insulation shall be 13. The board insulation shall be additionally clad in a multilayered laminate with a cold weather acrylic pressure sensitive adhesive. All joints of the cladding shall be sealed with tape

made of the same material as the cladding. Cladding and tape shall be as manufactured by VentureClad or approved equal.

E. All insulation shall be installed in accordance with the manufacturer's recommendations.

2.13 ACOUSTIC DUCT LINER

A. Furnish and install Armaflex SA duct liner or approved equal where indicated in these specifications.

B. Acoustic duct liner shall be 1 thick closed elastomeric foam sheet with self-adhering backing. Duct sizes indicated on the Drawings are inside dimensions. Sheet metal sizes are to be increased to compensate for the sound insulation.

C. Acoustic duct liner specifications and installation shall be in accordance with recommendations of the manufacturer The duct liner shall be Factory Mutual approved, meet the requirements of NFPA 90A and 90B and shall be approved by the State and Local Fire Marshal , shall meet the requirements of the International Energy Conservation Code and ASHRE and shall not exceed the allowable flame spread, fuel contributed and smoke developed ratings.

D. The ductwork listed below and/or noted on the Drawings shall be acoustically lined:

E. All transfer ducts

F. All inlet and discharge ductwork a distance of 10'-0" from all energy recovery units' units. Duct liner in the supply side ductwork shall be installed starting at the discharge of the unit to the hot water coil and then 10'-0" after the humidifiers.

2.14 ENERGY RECOVERY VENTILATORS

A. Furnish and install Energy Recovery Ventilators of size and capacity as shown on the drawings.

B. The Kilmor EVO Series is the Basis of Design for this project. Alternate manufacturers shall be Semco, DesChamps, Climate Craft, Venmar or approved equal. The specification information presented below applies to the three (3) Energy Recovery ventilators shall be adhered to without any exceptions.

C. Casing

1. Wall Panels with a thickness: 2.0 inches
2. Panels for floor and ceiling/floor with increased insulation thickness 2.76 inches
3. Sandwich type with thermal brake solution
4. Insulation material: PU foam
5. Modular construction
6. Skeleton made from anodized aluminum profiles or high anticorrosive steel profiles
7. Composite corners
8. Color: Metallic
9. Panel operation temperature: -40 to +190°F
10. External and internal side made of galvanized sheet with magnesium (DX51+ZM250
11. PPU density: 2.50 lb/ft3
12. Linear Density: 2 lb/ft2

13. Panel moisture absorption: 0.04%
14. Casing mechanical strength (deflection): ±10in WC: L=1/300
15. Casing Air Leakage: -1.6 in WC: 0.009 CFM/ft2; +2.8 in WC: 0.026 CFM/ft2
16. Casing Thermal Resistance: R = 13.1 Hr×ft2xF / BTU
17. Casing Thermal bridging: Kb = 0.69 (Class TB2, EN 1886: 2007)
18. Designed for indoor and outdoor installation
19. Casing fire rating: Non-fire spreading (ASTM E84).

D. Fans sets

1. General Description
   a. All fans installed in Energy Recovery Ventilators (ERVs) shall be tested according to the AMCA 210 and AMCA 310: Laboratory Methods for Testing Fans.
   b. All units shall be equipped with direct driven plenum Fans, with air foil backward-curved impellers with 7 blades made of a polymer composite material; the impellers shall be installed directly on the motor shafts. All power and sound ratings shall be tested & rated according to applicable AMCA Standards & Publications.
   c. All Fan Assemblies shall be belt-less, AMCA Arrangement 4.
2. Fan Impeller Mechanical and Thermal Specifications
   a. Number of blades: 7
   b. Material Name: SAN (AS) + 20GF
   c. Density: (ASTM-D792] 74.5 lb/ft3
   d. Tensile strength: 15.2PSI [ASTM D-638]
   e. Impeller balancing: Statically and dynamically balanced to the grade of G=6.3, in accordance to ISO 1940-1 and ANSI D2.19
   f. Fan impeller thermal specification
      1) Constant max temperature range: -4^0F to 176^0F
      2) Heat deflection temperature: 215 ^{0}F [ASTM D-648]
      3) Flammability according to UL: HB
3. Motors
   a. Fans shall be driven by motors as follows:
   b. ERV 1 + 3 shall be ECM type fans.
   c. ERV 2 motors shall include totally enclosed motors with VFDs.
   d. All of the motors used in the ERV shall be 3 phases. Nominal frequency: 60 Hz.
   e. Insulation class: F
   f. Efficiency class: Premium
   g. Bearings life: L10 = 20,000 h, L50 = 100,000 h

h. Motors used in submitted ERV units shall be supplied with the scheduled HP, Number of Poles, Approx. Rated Revolutions at 60Hz, and Motor Physical size).

4. Connecting Point
   a. Single power supply connection for each fan section
   b. Built in short circuit protection (circuit breakers) and main switch
   c. Enclosure class: NEMA 4
   d. Built-in VFD control and communication terminals
   e. Standard binary and analog signals for basic VFD control
   f. RS-485 MODBUS communication for VFD

E. Filters at both sides of enthalpy wheel
   1. MERV 8 and MERV 14
   2. Dust Spot Efficiency 30-35% and 90-95% respectively
   3. Arrestance 92%, >98% respectively
   4. Particle Size Typical Controlled Contaminant 3.0 – 10.0 µm, 0.3-1.0 µm
   5. Max air velocity: 625 FPM

F. Mixing Box
   1. Air inlet configurations
   2. Front-Top

G. Air Damper Specifications
   1. Damper installation: external
   2. Frame: Aluminum
   3. Opposed blades
   4. Blades: Aluminum, with rubber gaskets on the edges
   5. Damper Drive shaft: square pin 0.5x0.5 in
   6. Compliant with AMCA 500 standard

H. Drain pans
   1. Triple sloped towards condensate drainage point
   2. Stainless steel construction
   3. Maximum allowed air temperature measured above the heater: 149oF (overheat thermostat threshold point).

I. Energy Recovery Devices
   1. Rotary Heat Exchanger/Regenerator
   2. The rotary wheel thickness shall be 7.9 inch, installed on a shaft with bearing and built in a steel construction frame.
   3. The rotor filling element shall be a spiral built on two alternating layers of flat and corrugated aluminum sheets of 13 gauge creating ducts of hydraulic diameter of 0.06 inches.

4. The rotor perimeter and the dividing line shall have brush seals to provide additional protection against leakage.

5. The wheel shall rotate with a variable speed drive included on ERVs.

6. Wheel speed control shall be a signal from the ERV unit controller.

J. ERVs shall be furnished with:

1. All units shall be provided with a recirculation to maintain air circulation through the unit with the outdoor air intake dampers closed.

K. Limited Warranty

1. The ERV unit manufacturer shall warrants to buyers of its equipment that the Equipment will be free from defects in material and workmanship under normal use and maintenance for a period of twenty-four (24) months from the date of the shipment of equipment from the manufacturing facility (the "Limited Warranty Period"), provided the equipment has been installed and used in accordance with the manufacturer's guidelines and instructions. Minor defects will not give rise to a limited warranty claim.

2.15 VARIABLE REFRIGERANT FLOW FAN COIL UNITS

A. 4-Way Ceiling-Recessed Cassette with Grille Indoor Unit

1. The ceiling-recessed indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

2. Unit Cabinet:

a. The cabinet panel shall have provisions for a field installed filtered outside air intake.

b. Branch ducting shall be allowed from cabinet.

c. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

d. The grille vane angles shall be individually adjustable from a wired remote controller to customize the airflow pattern for the conditioned space

3. Fan:

a. The indoor fan shall be an assembly with a statically and dynamically balanced turbo fan direct driven by a single motor with permanently lubricated bearings.

b. The indoor unit shall include an AUTO fan setting capable of maximizing energy efficiency by adjusting the fan speed based on the difference between controller set-point and space temperature. The indoor fan shall be capable of five (5) speed settings, Low, Mid1, Mid2, High and Auto.

c. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.

d. The indoor unit fan logic must include multiple setting that can be changed to provide optimum airflow based on ceiling height and number of outlets used.

e. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

f. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.

g. Grille shall include a factory-installed "i-see" sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39' detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.

4. Filter:

a. Return air shall be filtered by means of a long-life high efficiency washable filter

5. Coil:

a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.

b. The coils shall be pressure tested at the factory.

c. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.

6. Electrical:

a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

7. Controls:

a. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

c. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

d. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

e. A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

8. Units shall be provided with Air outlet shutter plate, High efficiency filter and Multi-Function Casement.

B. 4-Way Ceiling-Recessed Cassette with Grille for 2x2 Grid Indoor Unit

1. The indoor unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

2. Unit Cabinet:

a. The cabinet shall be a compact 22-7/16” wide x 22-7/16” deep so it will fit within a standard 24” square suspended ceiling grid.

b. The cabinet panel shall have provisions for a field installed filtered outside air intake.

c. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

3. Fan:

a. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.

b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

c. The indoor unit shall include an AUTO fan setting capable of maximizing energy efficiency by adjusting the fan speed based on the difference between controller set-point and space temperature. The indoor fan shall be capable of five (4) speed settings, Low, Mid, High and Auto.

d. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.

e. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

f. Grille shall include a factory-installed “i-see” sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39’ detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.

4. Filter:
    a. Return air shall be filtered by means of a long-life washable filter.
5. Coil:
    a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
    b. The coils shall be pressure tested at the factory.
    c. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4" inches above the condensate pan.
6. Electrical:
    a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
    b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
7. Controls:
    a. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
    b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
    c. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
    d. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
    e. A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur, the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

C. Medium Static Ceiling-Concealed Ducted Indoor Unit
1. The ceiling-concealed ducted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.
2. Unit Cabinet:
    a. The unit shall be ceiling-concealed, ducted—with a 2-position, field adjustable return and a fixed horizontal discharge supply.

b. The cabinet panel shall have provisions for a field installed filtered outside air intake.

3. Fan:

a. Indoor unit shall feature multiple external static pressure settings ranging from 0.14 to 0.60 in. WG.

b. The indoor unit fan shall be an assembly with statically and dynamically balanced Sirocco fan(s) direct driven by a single motor with permanently lubricated bearings.

c. The indoor fan shall consist of three (3) speeds, High, Mid, and Low plus the Auto-Fan function

4. Filter

a. Return air shall be filtered by means of a standard factory installed return air filter

5. Coil:

a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.

b. The coils shall be pressure tested at the factory.

c. Coil shall be provided with a sloped drain pan. Units without sloped drain pans which must be installed cockeyed to ensure proper drainage, are not allowed.

d. The unit shall be provided with an integral condensate lift mechanism able to raise drain water 27 inches above the condensate pan.

6. Electrical:

a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

7. Controls:

a. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

c. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

d. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

D. Vertical/Horizontal Ducted (Multi-Position Air Handler)

1. The multi-position indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in air handling spaces in accordance with Section 18.2 of UL 1995 4th Edition, be tested in accordance with ANSI/ASHRAE 193 and have less than 2% air leakage at maximum airflow setting.
2. Unit Cabinet:
    a. The cabinet shall include a fixed bottom return, a fixed vertical discharge supply and be pre-painted, pre-insulated, 22-gauge galvanized steel.
3. Fan:
    a. The indoor unit fan shall be an assembly with a single, statically and dynamically balanced direct drive fan with a high efficiency DC motor with permanently lubricated bearings.
    b. The fan shall have 3-speeds with the capability to operate between 0.3-0.8 In. WG selectable.
4. Filter:
    a. The unit shall have a 1” filter rack with a reusable filter. Provide two sets of MERV 8 1” deep filters for the unit.
5. Coil:
    a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
    b. The coils shall be pressure tested at the factory.
6. Electrical:
    a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
    b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
7. Controls:
    a. The unit shall be provided with a wall mounted remote temperature sensor to maintain room temperature set point.
    b. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8-degree F deadband from set point.
    c. Unit shall be provided with relay kit and fan speed indicator adapter.

2.16 SIMULTANEOUS HEAT/COOL HEAT RECOVERY UNITS (ACCU-1, 2 & 3)

A. General

1. Per the equipment schedule, the variable capacity, heat pump heat recovery air conditioning system basis of design is Mitsubishi Electric CITY MULTI VRF (Variable Refrigerant Flow) zoning systems.

2. Acceptable alternative manufacturers, assuming compliance with these equipment specifications, are Daikin, Panasonic, and Hitachi. Contractor bidding an alternate manufacturer does so with full knowledge that that manufactures product may not be acceptable or approved and that contractor is responsible for all specified items and intents of this document without further compensation.

3. Simultaneous heating/cooling (heat recovery) systems shall consist of an outdoor unit, BC (Branch Circuit) Controller (or comparable branch devices), multiple indoor units, and an integral DDC (Direct Digital Controls) system. Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes.

4. No additional branch circuit controllers (or comparable branch devices) than shown on the drawings/schedule may be connected to any one outdoor unit. Contractors proposing alternate systems requiring more branch devices than those included as the basis of design are responsible for additional piping & electrical costs and are required to identify additional costs & installation time required of other trades with their bid.

B. Efficiency

1. ACCU-1 and ACCU-3 shall have no less than an EER of 13.5, an IEER of 30.4, a COP of 3.89.

2. ACCU-2 shall have no less than an EER of 11.9, an IEER of 28.0, a COP of 3.80.

C. Quality Assurance

1. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

2. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

3. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

4. All units must meet or exceed the 2018 International Energy Conservation Code 2018, 2010 Federal minimum efficiency requirements and the ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 1230.

5. System start-up supervision shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in system configuration and operation. The representative shall provide proof of manufacturer certification indicating successful completion within no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals.

D. Delivery, Storage and Handling

1. Unit shall be stored and handled according to the manufacturer's recommendation.

E. Warranty

1. The CITY MULTI units shall be covered by the manufacturer's limited warranty for a period of one (1) year parts and seven (7) year compressor to the original owner from date of installation.
2. Manufacturer shall have a minimum of fifteen (15) years continuous experience providing VRF systems in the U.S. market.
3. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.
4. The CITY MULTI VRF system shall be installed by a contractor with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

F. Outdoor Units

1. The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section and the controls section. The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
2. Outdoor unit systems may be comprised of multiple modules with differing capacity if a brand other than basis of design is proposed. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing lines. If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.
3. Outdoor unit shall have a sound rating no higher than 65 dB(A) individually or 68 dB(A) twinned. Units shall have a sound rating no higher than 52 dB(A) individually or 55 dB(A) twinned while in night mode operation. Units shall have 5 levels sound adjustment via dip switch selectable fan speed settings. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
4. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.
5. The outdoor unit shall have the capability of installing the main refrigerant piping through the bottom of the unit.
6. The outdoor unit shall have an accumulator with refrigerant level sensors and controls. Units shall actively control liquid level in the accumulator via Linear Expansion Valves (LEV) from the heat exchanger.
7. The outdoor unit shall have a high-pressure safety switch, over-current protection, crankcase heater and DC bus protection.
8. VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.

9. The outdoor unit shall be capable of operating in heating mode down to minus 25F ambient temperatures or cooling mode down to 23F ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.

10. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.

11. Unit must defrost all circuits simultaneously in order to resume full heating more quickly during extreme low ambient temperatures (below 23F). Partial defrost, also known as hot gas defrost which allows reduced heating output during defrost, is permissible only when ambient temperature is above 23F.

12. While in hot gas defrost the system shall slow the indoor unit fan speed down to maintain a high discharge air temperature, systems that keep fan running in same state shall not be allowed as they provide an uncomfortable draft to the indoor zone due to lower discharge air temperatures.

13. In reverse defrost all refrigerant shall be bypassed in the main branch controller and shall not be sent out to the indoor units, systems that flow refrigerant through indoor units during reverse defrost shall not be allowed.

14. The outdoor unit shall be provided with a manufacturer supplied 20-gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.

15. VRF four-legged outdoor unit mounting systems shall be provided by manufacturer. Stand shall be made from 7-gauge plate steel with thermally fused polyester powder coat finish that meets ASTM D3451-06 standards. Stands shall be provided with galvanized mounting hardware and meets all ASCE 7 overturning safety requirement.

16. Unit Cabinet:

    a. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

    b. The outdoor unit shall be tested in compliance with ISO9277 such that no unusual rust shall develop after 960 hours of salt spray testing.

    c. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised, and the panel should be replaced immediately.

17. Fan:

    a. Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fans only. Fans shall be factory set for operation at 0 in. WG. external static pressure, but capable of normal operation with a maximum of 0.32 in. WG. external static pressure via dipswitch.

    b. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

c. All fans shall be provided with a raised guard to prevent contact with moving parts.

18. Refrigerant and Refrigerant Piping:

a. R410A refrigerant shall be required for systems.

b. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

c. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.

d. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.

e. Refrigerant line sizing shall be in accordance with manufacturer specifications. Future changes to indoor unit styles or sizes must be possible without resizing/replacing refrigerant piping to any other branch devices or indoor units.

19. Coil:

a. Outdoor Coil shall be constructed to provide equal airflow to all coil face surface are by means of a 4-sided coil

b. Outdoor Coil shall be elevated at least 12" from the base on the unit to protect coil from freezing and snow build up in cold climates. Manufacturer's in which their coil extends to within a few inches from the bottom of their cabinet frame shall provide an additional 12" of height to their stand or support structure to provide equal protection from elements as Mitsubishi Electric basis of design. Any additional support costs, equipment fencing, and tie downs required to meet this additional height shall be responsibility of the HVAC Contractor to provide.

c. The outdoor heat exchanger shall be of zinc coated aluminum construction with turbulating flat tube construction. The coil fins shall have a factory applied corrosion resistant finish. Uncoated aluminum coils/fins are not allowed.

d. The coil shall be protected with an integral metal guard.

e. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

f. Unit shall be provided with panel heaters and have prewired plugs for the panel heaters when operating below ambient conditions of 1F to prevent any residual ice buildup from defrost.

g. Condenser coil shall have active hot gas circuit direct from compressor discharge on lowest coil face area to shed defrost condensate away from coil and protect from Ice formation after returning to standard heat pump operation. While in Heat Pump operation this lower section of the Outdoor Evaporator coil shall continually run hot gas from the compressor discharge to protect the coil from ice buildup and coil rupture. Manufacturers who do not have an active hot gas circuit in the lower section of the Outdoor coil to protect coil from freezing shall not be allowed to bid on project in markets where the outdoor unit will see temperatures below freezing.

20. Compressor:

a. Each outdoor unit module shall be equipped with only inverter driven scroll hermetic compressors. Non inverter-driven compressors, which may cause inrush current (demand charges) and require larger generators for temporary power shall not be allowed.

b. Each compressor shall be equipped with a multi-port discharge mechanism to eliminate over compression at part load. Manufacturer's that rely on a single compressor discharge port and provide no means of eliminating over compression and energy waste at part load shall not be allowed.

c. Crankcase heat shall be provided via induction-type heater utilizing eddy currents from motor windings. Energy-wasting "belly-band" type crankcase heaters are not allowed. Manufacturers that utilize belly-band crankcase heaters will be considered as alternate only.

d. Compressor shall have an inverter to modulate capacity. The capacity for each compressor shall be variable with a minimum turndown not greater than 15%.

e. The compressor shall be equipped with an internal thermal overload.

f. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

g. Manufacturers that utilize a compressor sump oil sensor to equalize compressor oil volume within a single module shall not be allowed unless they actively shut down the system to protect from compressor failure.

21. Controls:

a. The unit shall be an integral part of the system & control network described in the controls section and react to heating/cooling demand as communicated from connected indoor units over the control circuit. Required field-installed control voltage transformers and/or signal boosters shall be provided by the manufacturer.

b. Each outdoor unit module shall have the capability of 4 levels of demand control based on external input.

22. Electrical:

a. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz per equipment schedule.

b. The outdoor unit shall be controlled by integral microprocessors.

c. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.17 BRANCH CIRCUIT (BC) CONTROLLERS

A. General

1. BC (Branch Circuit) Controllers (or comparable branch devices) shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor units for heating or subcooled liquid refrigerant to flow to indoor units for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices which do not include controlled refrigerant subcooling risk bubbles in liquid supplied to indoor unit LEVs and are not allowed.

2. BC Controllers (or comparable branch devices) shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish and be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. BC Controllers (or comparable branch devices) shall be suitable for use in plenums in accordance with UL1995 ed 4.

B. BC Unit Cabinet:

1. The casing shall be fabricated of galvanized steel.

2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.

3. The unit shall house two tube-in-tube heat exchangers.

C. Refrigerant Piping (specifications in addition to those for outdoor unit):

1. All refrigerant pipe connections shall be brazed.

2. Future changes to indoor unit quantities or sizes served by BC Controller or comparable branch device must be possible with no piping changes except between the branch device and indoor unit(s) changing. Systems which might require future piping changes between branch device and outdoor unit—if changes to indoor unit quantities or sizes are made—are not considered equal and are not allowed.

D. Refrigerant valves:

1. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.

E. Condensate Management:

1. BC Controller (or comparable branch device) must have integral resin drain pan or insulate refrigeration components with removable insulation that allows easy access for future service needs. Cabinets filled with solid foam insulation do not allow for future service and are not allowed.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).

2. The BC Controller shall be controlled by integral microprocessors

3. The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total.

2.18 DUCT MOUNTED HOT WATER HEATING COILS

A. Furnish and install duct mounted hot water heating coils of size and capacity as shown on the drawings. Coils shall be DSWB as manufactured by Trane, Carrier, York or approved equal.

B. Coil shall be 0.020" copper 1/2" or 5/8" staggered in the direction of airflow. Tubes shall be mechanically expanded to the fins to provide continuous primary to secondary compression bond over the entire finned length. All joints shall be brazed.

C. Coils shall have the connections located to permit mounting of the coil for right- or left-hand air flow and have equal pressure drop through all circuits. Coils shall be circuited to provide the maximum mean effective temperature difference for maximum heat transfer rates.

D. Headers shall be seamless copper tubing. The headers shall have intruded tube holes to provide large brazing surface for maximum strength and inherent flexibility. The complete coil shall be tested with 315 pounds of air pressure under water and shall be suitable for use up to 250 psig and 300°F. Individual tube tests before installation of the headers is not considered satisfactory. Hydronic tests alone shall not be acceptable.

2.19 DUCT MOUNTED DIRECT EXPANSION COOLING COILS

A. Furnish and Install duct mounted, direct expansion cooling coils of size and capacity as shown on the drawings. Coils shall be as manufactured by Trane, Carrier, York or approved equal.

B. Coil tubes shall 5/8" or 1/2" copper on staggered centers with aluminum fins. Tubes shall be mechanically expanded to the fins to provide continuous primary to secondary compression bond over the entire finned length. All joints shall be brazed.

C. Coils shall be tested with 315 pounds of air pressure under warm water and be suitable for 250 psig working pressure. Coils shall be dehydrated with 140°F DB, 40°F dew point air before shipping. Coils hydrostatically tested will not be permitted. Coils shall be AHRI certified and Underwriters' Laboratories recognized. All coils shall be intertwined circuited.

D. Casings shall be constructed of stainless steel. Coils shall be suitable for duct installation and shall be provided with stainless steel drain pans.

E. Duct mounted direct expansion coils shall be provided with secondary drain pans and water sensors.

2.20 REMOTE AIR-COOLED CONDENSING UNITS (ACCU-4, 5 & 6)

A. Outdoor air-cooled condensing units shall be factory charged with the system charge required for the outdoor condensing unit, ten, (10) feet of tested condensing line, and the smallest rated indoor evaporative coil match. The unit shall be designed to operate at ambient temperatures up to 115°F. Cooling Capacities shall be matched with a wide selection of cooling coils that are AHRI certified. The condensing unit shall be certified to UL 1995. The exterior of the condensing unit shall be designed for exterior application.

B. The casing shall be constructed of heavy gauge, galvanized steel and painted with a weather-resistant powder paint finish. The corner panels shall be prepainted. All panels shall be subjected to 1000-hour salt spray test.

C. The refrigerant system controls shall include condenser fan, compressor contactor and low a high-pressure switch. A factory supplied; field installed liquid line dries shall be provided.

D. The compressor shall include internal over temperature resistance and efficient heat transfer. The condenser coil shall be protected on all four sides by louvered panels.

E. The condensing unit shall include evaporator defrost control with a thermal expansion valve for operation down to 30°F.

2.21 REGISTERS, GRILLS AND DIFFUSERS

A. Diffusers shall be Titus model TDCA-AA as standard, Kruger, Metal Aire or approved equal with opposed blade dampers. In 2x2 lay-in ceilings border style shall be type 3. In hard ceilings border style shall be 1. Color shall be white.

B. Supply air registers shall be Titus 272FL as standard, Kruger, Metal Aire or approved equal. Supply air registers shall be provided with opposed blade dampers. Color shall be white.

C. Return grills, exhaust grills and transfer grills in ceilings and high sidewalls shall be Titus model 50F, as standard, Kruger, Metal Aire or approved equal. In 2x2 lay-in ceilings border style shall be type 3. In hard ceilings border style shall be 1. Return registers and grills in low sidewall applications shall be Titus model 33 RS, as standard, Kruger, Metal Aire or approved equal with opposed blade dampers. Ducted return and exhaust grills shall be provided with opposed blade dampers and square to round duct collars. Color shall be white.

D. Return Air Registers shall be Titus model 50F, as standard, Kruger, Metal Aire or approved equal. In hard ceilings border style shall be 1. In 2x2 lay-in ceilings border style shall be type 3 Ducted exhaust registers shall be provided with opposed blade dampers, and square to round duct collars. Color shall be white.

2.22 STEAM HUMIDIFIERS

A. Furnish and install Self Generating electrode type steam humidifiers od size and capacity as shown on the drawings. Humidifiers shall be Carel HumiSteam as manufactured by Carel USA, LLC as standard. Alternate manufacturers shall be Nortec, Armstrong or approved equal.

B. The humidifiers shall be of the self-generating electrode type, electrically producing atmospheric steam in a plastic cylinder without the use of immersion type electric heating elements.

C. The humidifier cabinet shall be constructed of corrosion resistant materials with all metal surfaces powder coated and designed to be aesthetically pleasing. The unit cover when removed should allow 180° access for easy maintenance.

D. The electrodes shall be constructed of expanded low carbon steel, zinc plated and dynamically formed for precise current control, and minimization of arcing points. Electrical connection to the electrodes shall be by Snap-On connectors made out of phosphorous bronze.

E. The steam generating cylinder shall be constructed of a UL listed plastic having at least a 94HB safety rating when disposable, and 94V0 when cleanable.

F. The steam generating cylinder shall have twin cylinder full electrodes operating as an independent circuit from the main power electrodes. No artificial neutral circuits shall be required. Additionally, the cylinder full electrodes shall be used to detect foaming of the water.

G. The unit shall incorporate a power drain pump instead of drain solenoid to provide for more efficient flushing of the cylinder.

H. All internal electrical controls and components shall be prewired to appropriately marked terminals for field connection. All internal components and the cabinet shall be properly grounded and shielded to prevent any line or irradiative interference.

I. The humidifiers shall incorporate a true microprocessor control providing the following functions:

1. Automatic flushing of the steam generating cylinder based on conductivity, not just amperage draw, to extend the life of the electrodes. The humidifier shall read AND display the incoming water conductivity.
2. Pushbutton selection of drainage under power or timed drain to eliminate current leakage through the drain.
3. The humidifier shall be programmable to empty the steam generating cylinder after an extended period of non-use, to prevent corrosion of the electrodes and contamination of the water.
4. The humidifier shall be programmable to force periodic drains to handle water with abnormal qualities that become corrosive on overconcentration.
5. The humidifier shall be programmable to allow for a modulating hi-limit humidity sensor or outdoor temperature sensor for automatic trimming of the output to avoid condensation.
6. The humidifier shall have an hour counter with programmable maintenance alarm schedules.
7. The Control shall have the capability to be remote mounted up to 600 feet.
8. Digital LCD Display of:
9. Incoming water conductivity
10. Electric current draw in Amps
11. Output of the humidifier
12. Selected output limit
13. Model No. and unit configuration
14. Sensed %RH when configured
15. Display of %RH set point when configured
16. Display of differential when configured

J. The humidifier shall have the AFS anti-foaming system to allow automatic detection and correction of water foaming. The humidifier shall be capable of operating on water qualities ranging from 75-1250 MicroMhos conductivity. Softened water should not be used.

K. The humidifier microprocessor control shall incorporate complete diagnostics, including the following alarms and pre-alarms which shall be shown on the LCD display:

1. High electric current in the steam cylinder
2. Low current electrolysis condition
3. Reduced steam output, unable to reach set point
4. High water level in cylinder

5. Humidity sensor defective
6. Water foaming in cylinder
7. Improper cylinder fill rate
8. Improper cylinder drain rate
9. Diagnostic memory test fail
10. All pre-alarms shall be self-correcting.
11. The humidifiers shall be configured for Stand-alone Proportional with humidity readout operation.

L. Each humidifier shall be equipped with interface connection allowing for interface to the Variable Refrigerant Flow Centralized Controller. This shall be complete serial communication of all set points, status and alarms, not just acceptance of a modulating signal. Manufacturer shall have available graphic monitoring/control software capable of running in Windows.

M. The humidifiers shall be provided with a tempering valve (or integral mixing drain cooler) to allow mixing of cold water with the drain water to ensure a maximum of 140deg drain water.

N. The humidifier manufacturer shall provide flexible steam and condensate hose of sufficient length to provide connection from the humidifier to the duct-mounted dispersion device.

O. The humidifier manufacturer shall provide appropriate duct-mounted dispersion devices to work properly for the scheduled duct size and humidification load.

P. The humidifiers shall be installed as per the plans and drawings, connected to a potable cold-water feed line, and a hot water drain line and electrical service sized appropriately for the maximum current draw of the unit. All wiring shall be in accordance with national and local electrical codes.

Q. Manufacturer shall provide a control sensor reading from 0-100%RH, compatible with the humidifier system.

R. Manufacturer shall supply a duct mounted air flow proving device to prevent system operation on loss of air flow.

S. Manufacturer shall supply a duct mounted high limit humidistat to prevent condensation in the duct.

T. Each humidifier shall be installed with an HVAC contractor supplied drain pan and water sensor.

2.23 DRAIN PANS

A. Furnish and install custom manufactured drain pans where shown on the drawings and as specified herein. Secondary drain pans shall be located under all humidifiers, fan coil unit FCU-4, cooling coils and heating coils in the discharge ductwork of the energy recovery units and where shown on the drawings.

B. Provide details of the drain pans and drain piping shall be submitted to the Designer for review. Secondary drain pans, including their outlets and seals shall be designed and constructed in accordance with ANSI/ASRAE Standard 62.1-2013 or the latest edition.

C. Secondary drain pans shall be slopped at least 0.125 inches/foot from the horizontal toward the drain outlet or shall be otherwise designed to ensure that water drains freely from the pan.

D. The drain outlet shall be located at the lowest point of the drain pan and shall be of sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

E. The drain pan shall be located under the water producing device. Drain pan width shall be sufficient to collect water droplets across the entire width of the water producing device or assembly.

F. Secondary drain pans shall be constructed of 16-gauge, 304 stainless steel, self-supporting, slopped in the direction of the drain outlet, leak tight with welded seams. Secondary drain pans shall be designed, fabricated and installed to prevent standing water. Drain outlet shall be threaded and constructed of 304 stainless steel.

G. Drain pans under cooling coils and FCU-4 shall be insulated with1/2” thick, flexible closed cell elastomeric insulation. Insulation shall be Armaflex as standard or equivalent. The composite flame spread/smoke density shall not exceed 25/50. The insulation shall be fully adhered to the entire exterior of the drain pan with the insulation manufacturer’s recommended adhesive.

H. Drain pans and piping over electrical or telephone apparatus.

1. Wherever possible, route piping to avoid passing over electrical apparatus.

2. If piping cannot be routed away from electrical or telephone apparatus the HVAC Contractor shall provide drain pans properly strapped under all water and drainage lines passing over any electrical or telephone apparatus. Pans shall have 1-1/4" drain run to a service sink, or as directed. In no case shall any fittings, valves, or joints be located above any electrical or telephone panels, boxes or apparatus.

2.24 CEILING MOUNTED EXHAUST FANS

A. Ceiling mounted exhaust fans shall be of the centrifugal direct drive type. The fan housing shall be constructed of heavy-gauge galvanized steel. The housing interior shall be lined with 0.5 in. acoustical insulation. The outlet duct collar shall include a spring-loaded aluminum backdraft damper. Outlet shall be adaptable for horizontal or vertical discharge. The designer grille for shall be constructed of high-impact polystyrene. Grilles shall be non-yellowing.

B. Ceiling mounted exhaust fans shall be provided with wall mounted 24-volt thermostat, 120 to 24 volt 50 VA transformer, thermal overload protection,40 degree C ambient temperature rating, and aluminum grill with white enamel finish.

C. The access for wiring shall be external. The motor disconnect shall be an external disconnect switch shipped loose with the fan. The motor shall be mounted on vibration isolators. The fan wheel shall be of the forward-curved centrifugal type and dynamically balanced. All fans shall bear the AMCA Certified Ratings program AMCA Sound and Air Performance seal and shall be UL/cUL Listed. Ceiling or wall mount fans shall be model SP-A as manufactured by Greenheck Fan Corporation, Schofield, Wisconsin, Loren Cook, Penn Ventilator or approved equal.

D. Ceiling mounted exhaust fans shall be provided with unit mounted speed controllers.

2.25 DUCT MOUNTED SMOKE DETECTORS

A. The HVAC Contractor shall furnish and install duct mounted smoke detectors in ductwork. Duct mounted smoke detectors need to be compatible with the building fire alarm system. Duct mounted smoke detectors shall be furnished and installed with modules as required to interface with the building fire alarm system. The HVAC Contractor shall wire from the detectors to the associated HVAC unit control circuit for shutdown of fans. The HVAC Contractor shall also furnish remote test stations. The

HVAC Contractor shall wire the normally closed contacts in series to the fan starter holding coil. The Electrical Contractor shall wire the smoke detectors and the remote test stations to the duct mounted smoke detectors and to the building fire alarm panel.

B. Duct mounted smoke detectors shall be tested mechanically for duct mounted air tube flow with a manometer and electrically confirming alarm function. All tests shall be done in accordance with the smoke detector manufacturer's testing and installation instructions. A letter shall be sent to the Designer confirming positive results of the testing.

2.26 HOT WATER UNIT HEATERS

A. Furnish and install hot water unit heaters of size and capacity as shown on the drawings. Heaters shall be as manufactured by Sterling Radiator Company as standard, Modine, Beacon Morris or approved equal.

B. Construction

1. Heating element: fin and tube extended surface of aluminum fins mechanically bonded to seamless copper tubing, free to expand or contract without damage to adjacent tubes or header connections and incorporate a replaceable tube feature with tubes connected to the header by means of a mechanical nut and ferrule compression union.

2. Casing to be minimum 20-gauge die-formed steel. Casing top to be provided with threaded hanger connections for unit suspension.

3. The unit shall be factory tested at 500 psig hydrostatic and 200 psig steam pressure.

4. Horizontal units to be furnished with safety fan guard and horizontal air deflector blades.

C. Fan Unit

1. Each heater shall be provided with a non-overloading aluminum fan wheel connected to a constant speed motor with pre-lubricated, sealed ball bearings. The fan wheel shall be dynamically balanced and used in conjunction with an inlet venturi.

D. Paint

1. Each heater shall be finished in gray baked on alkyd resin enamel to withstand industrial environment, abrasion and impact.

E. Accessories

1. Furnish with threaded rod for hanging from ceiling.

2. Furnish with local disconnect switch and wall-mounted 24 volt thermostat

2.27 LOUVERS AND VENTS

A. Furnish and install where indicated on the Drawings. The louvers shall be 4" deep, dual drainable blade. Louvers shall be the product of one of the following or equal: Nailor Industries, model 1605WD, Arrow, Ruskin, or equal approved by the Designer.

B. Construction: Louvers shall be of all-welded 0.080" thick extruded aluminum 6063-T5 alloy and shall be arranged in full-height and width panels, with vertical aluminum mullions. Include all necessary vertical steel angle stiffeners, and all required shims, clips, fastening devices, anchors and other items to complete installation as indicated or required.

C. Furnish and install wind driven rain resistant blade louver constructed entirely of extruded aluminum alloy 6063-T5. Blades and frames shall be minimum .081" wall thickness. Louver assemblies shall be 6" deep with 19-degree stationary blades. Louver shall be fitted with 1/2" mesh by .063" diameter aluminum bird screen in a re-wirable extruded aluminum frame. Blades shall be joined to each jamb frame and vertical member with two fillet welds each 1" long with a minimum .125" throat. Frames shall be joined at each corner with a full-length fillet weld with a minimum .125" throat. Louver shear bear Air Movement and Control Association (AMCA) Certified Ratings Seal for air performance and water penetration ratings. Manufacturer shall submit AMCA Licensed data on a 48"x48" unit demonstrating that it provides a minimum of 8.64 SF of free area and shall intake 1025 FPM free area velocity at a static pressure drop not exceeding 0.32" H2O in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program.

D. Water penetration shall not exceed .01 ounces of water per square foot of free area at a velocity of 876 FPM when tested for 15 minutes per AMCA Publication 511.

E. After fabrication, louvers shall be factory primed and finished with a resin coating cured to produce a dry film thickness ranging from .1 to .2 mils. Color shall be selected by the Designer

2.28 MOTORS, STARTERS AND WIRING

A. Provide motors and controls for HVAC equipment. Provide control and other related wiring including interlocks. Power wiring (to panelboards, disconnect switches, starters and motors) will be provided by others. Starters that are not integral to equipment will be furnished by the HVAC contractor installed and wired by others

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 ½ 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:

Size (HP)	Nominal Efficiency (Min.)
1 – 3	84%
5 - 7-1/2	88.5%
10 - 25	90%
30 – 100	93%
100+	95%

D. Starters furnished for HVAC 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, pilot lights and switches in required configurations. Refer to 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 or as required by the Automatic Temperature Controls Contractor, 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.

2.29 VIBRATION ISOLATION

A. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on Drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.

B. Unless otherwise noted, all rotating HVAC equipment shall be mounted and/or hung on spring type vibration isolators to prevent the transmission of vibration and Mechanically transmitted sound to the building structure. Rubber type isolators shall not be acceptable. Spring isolators shall be selected for a 2" deflection.

C. All pipe connections to equipment shall be made with braided pipe vibration isolators.

D. All duct connections to fans and roof mounted air handling equipment and roof mounted HVAC units shall be made with neoprene coated flexible duct connections.

2.30 SEISMIC RESTRAINT REQUIREMENTS

A. Furnish and install seismic restraints as required by the Massachusetts State Building Code 9th Edition, and the International Building Code 2015.

B. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements:

C. Ability to accommodate relative seismic displacements of supported item between points of support.

D. Ability to accommodate the required seismic forces.

E. For each respective set of anchor bolts provide calculations to verify

F. Adequacy to meet combined seismic-induced sheer and tension forces.

G. For each weldment between structure and item subject to seismic force, provide calculations to verify adequacy.

H. A professional engineer who is registered in the State of Massachusetts and has specific experience in seismic calculations shall stamp calculations.

I. Restraints shall maintain the restrained item in a captive position without short-circuiting the vibration isolation.

J. Provide seismic restraints for all ductwork and equipment, seismic restraints for the Attic mounted HVAC equipment, piping and ductwork in accordance with the requirements of the Massachusetts State Building Code 9th Edition, and the International Building Code 2015.

2.31 AIR PURIFICATION SYSTEM

A. Furnish and install an Air Purification System of size and capacity as indicated herein in each of the three Energy Recovery Ventilators and FCU-4 in accordance with the manufacturer's installation instructions. Length of air purification in duct tubes shall be as recommended by the air purification system manufacturer. Basis of design is Global Plasma Solutions. American Ion shall be considered equal subject to meeting all specifications herein. All other manufacturers requesting prior approval must submit product drawings, specifications and test results specified in section K. below at least four weeks prior to bid date.

B. The Air Purification System shall be a product of an established manufacturer within the USA.

C. A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system to ensure installation in accordance with manufacturer's recommendation.

D. Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters shall not be considered. Uni-polar ion generators shall not be acceptable. "Plasma" particulate filters shall not be acceptable.

E. Projects designed using ASHRAE Standard 62, IAQ Procedure shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air scheduled with the technology submitted. The manufacturer shall provide independent test data on a previous installation performed within the last two years and in a similar application, that proves compliance to ASHRAE 62 and the accuracy of the calculations.

F. The Air Purification System shall have been tested by UL or Intertek/ETL to prove conformance to UL 867-2007 including the ozone chamber testing and peak ozone test for electronic devices. Manufacturers that achieved UL 867 prior to December 21, 2007 and have not been tested in accordance with the newest UL 867 standard with the ozone amendment shall not be acceptable. All manufacturers shall submit their independent UL 867 test data with ozone results to the engineer during the submittal process. All manufacturers shall submit a copy with their quotation. Contractors shall not accept any proposal without the proper ozone testing documentation.

G. The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be 0.007 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the electronic air cleaner's output shall be no more than 0.0042 PPM. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.

H. Referenced Codes and Standards

1. The following codes and standards are referenced throughout. The edition to be used is that currently enforced by the authority having jurisdiction (AHJ) or in absence of such direction that referenced by the current enforceable IBC code or as indicated by the contract documents, except where specifically referenced by this section of the specifications.

    a. ASHRAE Standards 62 & 52

    b. National Electric Code NFPA 70

    c. UL 867 including ozone chamber test required as of December 21, 2007

I. Submittals

1. Product Data: Submit manufacturer's technical product data for ion generators including:
2. Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.
3. Data sheet for each type of plasma generator, and accessory furnished; indicating construction, sizes, and mounting details.
4. Performance data for each type of plasma device furnished.
5. Indoor Air Quality calculations using the formulas within ASHRAE Standard
6. 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air scheduled.
7. Product drawings detailing all physical, electrical and control requirements.
8. Copy of UL 867 independent ozone test.
9. Operating & Maintenance Data: Submit O&M data and recommended spare parts lists.

J. General

1. The air purification systems shall be of the size, type, arrangement and capacity indicated and required by the unit furnished and shall be of the manufacturer specified.
2. Basis of Design: Global Plasma Solutions
3. All other Suppliers of comparable products requesting prior approval shall:
4. Submit for prior approval in accordance with the requirements of Section 15010.
5. In addition, manufacturers submitting for prior approval for bi-polar ionization must as part of the prior approval request provide their ASHRAE 62.1-2007 calculations that prove conformance to the ASHRAE Standard with the reduction of outside air to the scheduled values. A letter on the manufacturer’s letterhead requesting prior approval must accompany the request for prior approval stating their calculations are ASHRAE compliant. A third-party validation study performed on a previous installation of the same application shall also be included.
6. Submit independent test data from ETL or UL showing ozone levels produced during the UL 867 ozone chamber test. Manufacturers without this test data shall not be acceptable.

K. Bi-Ionization Design and Performance Criteria

1. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Plasma Generator with Bi-polar Ionization output as described here within.
2. The bi-polar ionization system shall be capable of:
3. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
4. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
5. Capable of reducing static space charges.

6. Increasing the interior ion levels, both positive and negative, to a minimum of 800 ions/cm³ measured 5 feet from the floor.
7. Self-cleaning requiring no maintenance or replacement parts.
8. Producing a minimum of 160M ions/cc.
9. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable.
10. Air exchange rates may vary through the full operating range of a constant volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.
11. Velocity Profile: The air purification device shall not have maximum velocity profile.
12. Humidity: Plasma generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wash down duty.

L. Electrode Specifications (bi-polar ionization):

1. Each plasma generator with bi-polar ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. A minimum of one electrode pair per 2,400 CFM of air flow shall be provided. Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time, ozone production and corrosion.
2. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Electrodes shall be made from carbon fiber to prevent oxidation over time. Internal circuitry shall be provided to sense air flow across the electrode output. Ionization systems requiring the use of a mechanical air pressure switch to cycle the electrodes only when the fan is operating shall not be acceptable due to high failure rates and pressure sensitivity.
3. Electrode pair shall provide a minimum of 160 million ions per cubic centimeter as measured at 2 inches, both positive and negative ions, in equal quantities. Devices providing less than 160 million ions/cc per electrode pair shall not be acceptable.
4. Each plasma generator shall be provided with a self-cleaning system that is field programmable to change the number of days between the cleaning cycle. Systems without a no-maintenance, self-cleaning system shall not be acceptable.
5. Each electrode pair shall be designed with a banana style plug such that it can be field replaced, if necessary.
6. Each Plasma Generator shall be provided with an inline on/off switch, universal voltage input (24VAC to 240VAC or DC), magnets for mounting to the fan inlet, replaceable carbon fiber emitters and a programmable self-cleaning system.

M. Ionization Requirements:

1. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.

2. The Bi-polar ionization system shall consist of bi-polar plasma generator and integral power supply. The bi-polar system shall be installed where indicated on the plans or specified to be installed. The device shall be capable of being powered by 24VAC to 240VAC without the use of an external transformer. Ionization systems requiring isolation transformers shall not be acceptable.
3. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable.
4. Ionization output from each electrode shall be a minimum of 160 million ions/cc when tested at 2" from the ionization generator.
5. All manufacturers shall provide documentation by an independent NELAC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:
    a. MRSA - >96% in 30 minutes or less
    b. E.coli - > 99% in 15 minutes or less
    c. TB - > 69% in 60 minutes or less
    d. C. diff - >86% in 30 minutes or less
6. Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELEC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in section M 5, points 5.a, 5.b, 5.c, 5.c. Products tested only on Petri dishes to prove kill rates shall not be acceptable.

N. Ozone Generation:

1. The operation of the electrodes or Bi-polar ionization units shall conform to UL 867-2007 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.

O. Electrical Requirements:

1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma generator shall accept an electrical service of 24VAC to 240VAC, universal 2 wire input, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.

P. Control Requirements:

1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset circuit breakers. Systems with manual fuses shall not be allowed.
2. Integral airflow sensing shall be provided with the units and modulate the plasma output as the airflow varies or stops. A mechanical airflow switch shall not be acceptable as a means to activate the plasma device due to high failure rates and possible pressure reversal.
3. The installing contractor shall mount and wire the plasma device within the energy recovery ventilator unit specified or as shown or the plans. The contractor shall follow all manufacturer IOM instructions during installation.

4. All plasma devices shall have a dry contact to prove there are ions being produced. Systems providing indication that power is applied to the plasma device, but not directly sensing the power at the ion output, shall not be acceptable.

Q. Warranty

1. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of eighteen months after shipment or twelve months from owner acceptance, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor.

2.32 AUTOMATIC TEMPERATURE CONTROLS

A. The Automatic Temperature Controls Contractor (ATC) as part of the HVAC contractors scope of work shall furnish and install, as hereinafter specified, a standalone, electronic/electro-mechanical temperature control system for the new energy recovery ventilators, new unit heaters, direct expansion refrigerant coils in the ductwork after the energy recovery ventilators and matching air cooled condensing units, hot water coils in the ductwork after the energy recovery ventilators, exhaust fans, cabinet heaters at entry doors, stairwells and Attic mounted humidifiers.

B. Protocol shall be as determined by the Automatic Temperature Controls Contractor and the Designer.

C. Variable refrigerant flow systems controls shall be furnished by the manufacturer of the variable refrigerant flow systems, installed and wired by the Automatic Temperature Controls Contractor. Install all control equipment, dampers and accessories supplied with the new HVAC equipment but not installed by the manufacturer. Furnish and install controls and wiring for exhaust fan and dampers, intake dampers for the new energy recovery ventilators, and hot water coil control valves.

D. The microprocessor based variable refrigerant flow systems shall provide weekly scheduling, on-off control of the energy recovery ventilators, duct mounted cooling and heating coils, remote air-cooled condensers, unit heaters and humidifiers. Monitoring and remote access of these devices shall be over a telephone application or internet provider.

E. The systems to be comprised of various microprocessor based (variable refrigerant flow systems) and independent stand-alone, electro-mechanical control equipment, thermostats, sensors, dampers, actuators, panels and related hardware, and other accessory equipment, along with a complete system of electrical control wiring to fill the intent of the specifications and provide for a complete and operable system.

F. System Installer Qualifications

1. The installer shall have an office within 50 miles of the project site and provide 24-hour response in the event of a customer call.

2. Work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of local, state and federal authorities. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:

a. National Electric Code (NEC)

b. International Building Code 2015 (IBC)

c. International Mechanical Code 2015 (IMC)

d. International Energy Conservation Code 2018 (IECC)

e. Underwriters Laboratories: Products shall be UL-916-PAZX listed.

3. The ATC Contractor shall provide shop drawings and manufacturers' standard specification data sheets on all hardware to be provided. No work may begin on any segment of this project until the Designer and Owner have reviewed submittals for conformity with the plan and specifications. Six (6) copies are required. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats or in hard copy as determined by the Designer.

4. Quantities of items submitted shall be reviewed by the Designer and Owner. Such review shall not relieve the contractor from furnishing quantities required for completion.

5. Provide the Designer and Owner, any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.

G. Submit the following within 30 days of contract award:

1. Three copies of drawings of the components and devices for the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions for all controllers, dampers, sensors, thermostats, carbon dioxide sensors, etc. Drawings shall contain schematic diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings.

H. Warrant all work as follows:

1. Labor & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.

2. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Designer, the HVAC Contractor shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of warranty.

3. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 2 years. The installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing. Spare parts shall be available for at least 5 years after completion of this contract.

I. Scope

1. In general, this specification is intended to cover following:

a. Unoccupied and occupied operation the Variable Refrigerant Flow HVAC system (VRF) controls.

b. Unoccupied and occupied operation of new, duct mounted hot water coils, duct mounted refrigerant coils and associated remote air-cooled condensing units exhaust fans, and humidifiers.

c. The ATC Contractor shall furnish and install all controls, wiring, sensors and all necessary devices to provide unit operation in accordance with the Sequence of Operation for the Energy Recovery Ventilators.

d. Furnishing and installation of automatic dampers and valves

e. Provision of blank-off plates (safing) for dampers that are smaller than duct size.

f. Assembly of multiple section dampers with required inter-connecting linkages and shafts through duct for external mounting of damper motors.

g. Provision of access doors for service to control equipment.

J. Electric Wiring:

1. Electric wiring and wiring connections required for installation of temperature control system, as herein specified, shall be provided by HVAC Contractor unless otherwise indicated on drawings.

2. Wiring shall comply with requirements of National Electric Code.

K. Dampers

1. Automatic dampers, furnished by ATC Contractor, shall be single or multiple blade, low leakage dampers as required and/or shown on the drawings.

2. Numerous references are made in this specification as to the responsibility of furnishing and installation of dampers and operators. The ATC Contractor shall closely coordinate his work with the equipment manufacturer to assure that all dampers are provided as required, and it shall examine all pertinent specification sections to assure that all dampers required but not provided by equipment manufacturers are provided under this contract.

3. Dampers and control valves shall be installed by the HVAC Contractor or installed at the factory by the equipment manufacturer.

4. Operators shall be provided by the ATC Contractor for all types of valves and dampers whether they are provided by equipment manufacturer or by the HVAC Contractor.

L. Control Valves

1. Control valves shall be two-way or three-way pattern as specified, constructed for tight shut off and shall operate satisfactorily against system pressures and differentials. Two-way control valves shall exhibit equal percentage characteristics. Valves with size up to and including 2” shall be screwed with 250 psi ANSI pressure body rating; 2 ½” and larger valves shall be flanged configuration. Proportional control valves shall be sized for a maximum pressure drop of 4.0 psig at rated flow (except as noted). Two-position control valves shall be line size and shall be provided with a 250 psi static pressure body rating.

2. All valves shall be capable of operating in sequence when required by the sequence of operation. All control valves shall be sized by the ATC Sub-contractor and shall be guaranteed to meet heating/cooling loads specified.

3. All control valves shall be suitable for the pressure conditions and shall close against the differential pressure involved. Valve operator connection type (screwed of flanged) shall conform to pipe schedule in this specification.

4. Hot water control valves shall be normally open. Valves shall be single seated with equal percentage flow characteristics. The valve discs shall be composition type with bronze trim.

5. Valves shall be sized on the exact pressure drop for the equipment served to prevent over or under sizing the valves. Provide a separate submittal with all of this information included.

M. Actuators and/or operators

1. All damper and valve actuators/operators shall be fully proportioning, or 2-position as specified. They shall be quiet in operation and shall have ample power to overcome friction for damper linkage and air pressure acting on louvers to position dampers accurately and smoothly. The damper actuator/operator mounting arrangement shall be outside the airstream wherever possible, with a maximum of 16 square feet per actuator/operator.

2. The actuators/operators shall be capable of operating at varying rates of speed to correspond to the dictates of the controllers and variable load requirements. The actuators/operators shall be capable of operating in sequence when required by the sequence of operation. The actuators/ operator shall have external adjustable stops to limit the stroke in either direction. The actuator/operator linkage arrangement shall be such as to permit normally open or normally closed positions of dampers as required.

3. For exact requirement and quantities of actuators/operators, see plans and coordinate with the equipment manufacturer.

4. Damper and valve actuators (electronic) if provided by the HVAC Contractor

5. Actuators shall be of the gear train or hydraulic type.

6. Actuators shall have integral mechanical stroke limiting adjustments to prevent actuator over stroke and automatic load sensing to protect from motor burnout in stall condition.

7. All actuators shall be of the direct analog fully proportioning variety. Two position or floating type control actuators may be furnished and installed in order to meet the requirements of the sequence of operation.

N. Variable Refrigerant Flow Systems Controls, General

1. The control system shall consist of a low voltage communication network and a web-based interface. The controls system shall gather data and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

2. Furnish energy conservation features such as optimal start, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.

3. System shall be capable of email generation for remote alarm annunciation.

O. Electrical Characteristics

1. Controller power and communications shall be via a common non-polar communications bus and shall operate at 30VDC.

2. Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.

3. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web-based interface), to the power supply.
4. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.
5. Network wiring shall be CAT-5 with RJ-45 connection.

P. City Multi Controls Network

1. The CITY MULTI Controls Network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web-based interface communicating over a high-speed communication bus. The CITY MULTI Controls Network shall support operation monitoring, scheduling, occupancy, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces. The below figure illustrates a sample CMCN System Configuration.

Q. Graphical User Interface

1. The Graphical User Interface (Integrated Centralized Control Web) shall require a field supplied PC or Tablet.
2. The Integrated Centralized Control Web System (ICCW) interface shall enable the user to control multiple AE-200, AE-50, EW-50's and shall provide additional functions such as energy apportionment from a single network PC configured with the Charge Calculation Tool. The ICCW shall be capable of controlling up to forty AE-200/AE-50/EW-50 Centralized Controllers with a maximum of 2,000 indoor units across multiple CITY MULTI outdoor units.
3. The ICCW shall be required if the user wants to simultaneously control more than 1 AE-200/AE-50/EW-50 Centralized Controllers from a single PC or tablet using a single web browser session. Licensing per function, per AE-200/AE-50/EW-50 Centralized Controller shall be required for the ICCW. Optional software features shall be available through the ICCW including energy apportionment and personalized web. These optional software features shall require the ICCW, advance purchase from the customer, and licensing from ICCW.

R. The CMCN shall be capable of supporting future integration with Building Management Systems (BMS) via industry standard communication protocols including BACnet and LonWorks®

1. The VRF micro-processor centralized systems serving the Town Hall sand the Library for which one-to-one electricity metering is not possible, an apportioned electricity billing function that attributes just the electrical energy consumed by each individual tenant's air conditioner is required. The Energy Apportionment function takes the information on the electrical energy usage gathered from Watt Hour Meters (WHM) connected to dedicated breaker panels serving the system's outdoor units and synthesizes it with the information on the operating status of the indoor units that is collected by the CITY MULTI centralized controllers.

2. The Watt Hour Meters (WHMs) to be used to read the electrical energy consumption of the outdoor units must be capable of a pulse output, which would be configured based on the current rating of the units. The associated current transformers/ transducers (CTs) must also be sized based on the current rating of either the individual outdoor units or the dedicated air conditioning electrical panels they are to be reading. The proper quantity of meters for a particular sized system must be selected in order to ensure sufficient resolution and hysteresis in the unit pulse output of the meters so as to ascribe an acceptable level of accuracy to the apportionment of energy usage for each tenant's system. The system is designed to work with any WHM capable of a pulse output that meets ANSI C12.20 class 0.2% or 0.5% accuracy standards.

3. The WHMs are to be physically connected to the integrated pulse input module or an external Mitsubishi Electric PI Controller if such an input is not available or if there is a wiring length limitation or installation hardship. The cable type of the interconnecting wiring shall be according to the wiring specifications of the WHM manufacturer.

4. Each centralized controller (AE-200/AE-50/EW-50) to which units are assigned that require the energy apportionment function must have the "SW-Charge" software license purchased and properly unlocked in order to enable the operating status of the indoor units to be passed to the energy apportionment tool. The procedure for licensing the centralized controllers with this function and the necessary forms can be found on Mitsubishi Electric's technical documentation repository, mylinkdrive.com. Purchase Order information for the licenses will be required at the time of submission of the licensing request forms.

5. A dedicated AE-200 centralized controller, for which the SW-Charge license is purchased and the energy apportionment function enabled, must be provided in order to serve as the portal for exporting metering device and energy management data to a USB drive or to a PC via LAN connection. This means that by virtue of selecting this AE-200 to serve this function, the MNET capability of this particular centralized controller will be disabled. All indoor units must be physically wired via MNET to other centralized controllers (AE-50/EW-50), which must be physically wired via LAN with Static IP addresses and a network hub or switch to the AE-200 Apportionment controller.

6. A networked PC, which does not necessarily have to be dedicated to the task of collecting energy apportionment data, can be provided and loaded with the Charge Calculation Tool software for exporting data necessary to generate billing documentation to be performed by a third party. The system requirements of the PC are as follows:

7. Simple MA Remote Controller (PAC-YT53CRAU):

    a. The Backlit Simple MA Remote Controller shall be capable of controlling up to 16 indoor units (defined as 1 group).

    b. The Backlit Simple MA Remote Controller shall only be used in same group with Wireless MA Remote Controllers (PAR-FL32MA-E / PAR-FA32MA-E) or with other Backlit Simple MA Remote Controllers (PAC-YT53CRAU), with up to two remote controllers per group.

S. AE-200 Centralized Controller:

1. The AE-200A Centralized Controller shall be capable of controlling a maximum of two hundred (200) indoor units across multiple CITY MULTI outdoor units with the use of three (3) AE-50A expansion controllers. The AE-200A Centralized Controller shall be approximately 11-5/32" x 7-55/64" x 2-17/32" in size and shall be powered with an integrated 100-240 VAC power supply. The AE-200A Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. When being used alone without the expansion controllers, the AE-200A Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a collection of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the AE-200 Centralized Controller shall include on/off, operation mode selection cool, heat, auto, dry, setback and fan, temperature setting, fan speed setting, and airflow direction setting.

2. The AE-200A Shall provide centralized control, it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the AE-200A Centralized Controller shall allow the user to define both daily and weekly schedules (up to 24 scheduled events per day) with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

3. All AE-200A Centralized Controllers shall be equipped with two RJ-45 Ethernet ports to support interconnection with a network PC via a closed/direct Local Area Network (LAN) or to a network switch for IP communication to up to three AE-50A expansion controllers for display of up to two hundred (200) indoor units on the main AE-200A interface.

4. The AE-200A Centralized Controller shall be capable of performing initial settings via the high-resolution, backlit, color touch panel on the controller or via a PC browser using the initial settings.

5. Standard software functions shall be available so that the building manager can securely log into each AE-200A via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Additional optional software functions of personal browser for PCs and MACs and Energy shall be available but are not included. The Energy Apportionment function shall require TG-2000 Integrated System software in conjunction with the Centralized Controllers.

6. AE-50A Expansion Controller:

7. The AE-50A Expansion Controller shall serve as a standalone centralized controller or as an expansion module to the AE-200A Centralized Controller for the purpose of adding up to 50 indoor units to either the main touch screen interface of the AE-200A. Up to three (3) AE-50A expansion controllers can be connected to the AE-200A via a local IP network (and their IP addresses assigned on the AE-200A) to the AE-200A to allow for up to two hundred (200) indoor units to be monitored and controlled from the AE-200A interface.

8. The AE-50A expansion controllers have all of the same capabilities to monitor and control their associated indoor units as the features specified above. Even when connected to the AE-200A and configured to display their units on the main controller, the individual indoor units connected to the AE-50A can still be monitored and controlled from the interface of the AE-50. The last command entered will take precedence, whether at the wall controller, the AE-50A or the AE-200A Centralized Controller.

T. EW-50GU Centralized Controller:

1. The EW-50 Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple CITY MULTI outdoor units. The EW-50 Centralized Controller shall be approximately 8-1/2”x10” in size and shall be powered from the external power supply (PAC-SC51KUA). The EW-50 Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, free contact interlock configuration and malfunction monitoring.

2. The EW-50 Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation).

3. This basic set of operation controls for the EW-50 Centralized Controller shall include on/off, operation mode selection (cool, heat, auto (R2/WR2-Series only), dry, temperature setting, fan speed setting, and airflow direction setting. Since the EW-50 provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the EW-50 Centralized Controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

4. All EW-50 Centralized Controllers shall be equipped with two RJ-45 Ethernet port to support interconnection with a network PC and BACnet/IP communication via a closed/direct Local Area Network (LAN). The EW-50 Centralized Controller shall be capable of performing initial settings online via a PC using the EW-50 Centralized Controller’s initial setting browser or online/offline with the Initial Setting Tool.

5. Standard software functions shall be available so that the building manager can securely log into each EW-50 via the PC’s web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Standard software functions shall not expire. Additional optional software functions of personal browser for PCs and MACs and Energy Allocation shall be available. The Energy Allocation function shall require AE-200 Energy Allocation Integrated System in conjunction with EW-50 Centralized Controllers.

U. The CMCN shall be capable of supporting integration with Building Management Systems (BMS).

1. BAC-Net® Interface:

a. The Electric Cooling & Heating BACnet® interface, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address.

2. Licenses:

a. SW-BACnet Master: Master Controller license for AE-200A and EW-50A

b. SW-BACnet Expansion: Expansion Controller license for AE-50A and EW-50A

c. SW-BACnet Specifications:

d. Control up to 50 groups

e. 1 to 16 indoor units can be collectively controlled in a group

f. Supports dual set point functionality (connected model dependent)

g. BTL Compliant

h. BACnet communication specifications are based on ANSI/ASHRAE Standards 135-2010

i. PC Requirements:

j. CPU: 1GHz or higher

3. Memory: 1GB or more

4. HDD Space: 100 MB or more

5. Screen Resolution: 1024 x 768 or higher

6. OS: Microsoft Windows 7 32-bit/64-bit, Microsoft 8.1 32-bit/64-bit. Not compatible with Windows Vista

7. Execution Environment: Microsoft .NET Framework 4.5 or later

8. Others: Pointing device such as a mouse, internet connection (required when installing a .NET Framework)

V. LonWorks® Interface:

a. The Electric Cooling & Heating LonWorks® interface, shall support up to fifty indoor units with a variety of network variables on a per indoor unit basis. Input variables include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, and filter sign reset. Output variables include, but are not limited to, model size, alarm state, error code, and error address.

W. Warning Labels

1. Permanent warning labels shall be affixed to all equipment which can be automatically started by the automatic temperature control system.

2. Labels shall use white lettering (12-point type or larger) on a red background.

3. Warning labels shall read as follows:

C A U T I O N

This equipment is operating under automatic control

and may start or stop at any time without warning.

Switch disconnect to "Off" position before servicing.

a. Permanent warning labels shall be affixed to all motor starters and all control panels which are connected to multiple power sources utilizing separate disconnects.

b. Labels shall use white lettering (12-point type or larger) on a red background.

c. Warning labels shall read as follows

C A U T I O N

This equipment is fed from more than one

power source with separate disconnects.

Disconnect all power sources before servicing.

SEQUENCE OF OPERATION

Fan Coil Units and Associated Condensing Units

Heating and Cooling Indexing

All heating and cooling equipment shall be indexed based on a calendar schedule which shall include weekly and holiday Occupied and Unoccupied systems operation. In general, the unit temperature sensor shall provide heating and cooling to the respective space as required to maintain temperature set point. There shall be a three (3) degree Fahrenheit (adjustable) dead band between heating and cooling.

Recovery Algorithm

Software shall provide for continuous trend logging of space temperature, outside air temperature, time of day and time to recover from setback/setup in order to generate a recovery curve. The curve shall be used to determine how many minutes before occupied cycle the building Energy Recovery Ventilators, and VRF system units must be started into cool down or warm up modes in order to reach occupied set points at scheduled times.

VRF Fan Coil Cassette and Concealed Ducted Units

The scheduling of the VRF Fan Coil Units hall be controlled through unit return mounted temperature sensors and the VRF manufacturer's Centralized Controllers and Expansion Controllers.

Occupied Heating: The supply fan shall run continuously. On a call for heating the unit shall cycle its refrigerant control valve to maintain a constant space temperature of 72°F (adjustable).

Unoccupied Heating: On a call for heating from any zone all zones will be activated. The supply fans shall be enabled, and the units shall open their refrigerant control valves to maintain a constant space night set back temperature of 55° F (adjustable.). Once all zones are satisfied the supply fans and heating operation shall be disabled.

Occupied Cooling: The supply fan shall run continuously. On a call for cooling the unit shall cycle its refrigerant control valve to maintain a constant space temperature of 75°F (adjustable).

Unoccupied Cooling: The supply fan and cooling operation shall be disabled.

Alarms

If the water level sensor in the respective fan coil unit senses a potential overflow condition the fan coil unit shall be disabled, and an alarm shall be sent to the central

VRF Fan Coil Unit for Meeting Room FCU-4

The scheduling of the VRF Fan Coil Unit shall be controlled through wall mounted temperature sensor and the VRF manufacturer's Centralized Controllers and Expansion Controllers.

Occupied Heating: The supply fan shall run continuously. On a call for heating the unit shall cycle its refrigerant control valve to maintain a constant space temperature of 72°F (adjustable).

Unoccupied Heating: On a call for heating from any zone all zones will be activated. The supply fans shall be enabled, and the units shall open their refrigerant control valves to maintain a constant space night set back temperature of 55° F (adjustable.). Once all zones are satisfied the supply fans and heating operation shall be disabled.

Occupied Cooling: The supply fan shall run continuously. On a call for cooling the unit shall cycle its refrigerant control valve to maintain a constant space temperature of 75°F (adjustable).

Unoccupied Cooling: The supply fan and cooling operation shall be disabled.

Alarms

If the water level sensor in the fan coil unit senses a potential overflow condition the fan coil unit shall be disabled, and an alarm shall be sent to the central

VRF Heat Recovery Heat Pump Condensing Units Control (ACCU-1, ACCU-2 and ACCU-3)

The scheduling of the Heat Recovery Heat Pump Units hall be controlled through the VRF manufacturer's Centralized Controllers and Expansion Controllers.

Cooling: The unit shall be enabled during the occupied mode. It shall utilize its factory mounted controls & interface with the FCUs to maintain a constant refrigerant discharge temperature and pressure. The unit shall be disabled during the unoccupied mode.

Heating: The unit shall be enabled during the occupied mode. The unit shall utilize its factory mounted controls & interface with the FCUs to maintain a constant refrigerant discharge temperature and pressure. Upon a drop in the outside air temperature below 8°F (adjustable) the condensing unit shall de-energize During the unoccupied mode the condensing unit shall only energize when one of the zones calls for heat.

ACCU-3 shall be provided with a wall switch located in the Meeting Room and another in the Town Administrator's Office either of which shall override the unoccupied cycle for the

associated fan coil units and the air cooled condensing unit ACCU-3 for a preset period of three hours (adjustable) after which time the fan coils and the condensing unit shall return to scheduled unoccupied mode.

Energy Recovery Ventilator Units ERV-1, ERV-2 and ERV-3

The Energy Recovery Ventilators shall be supplied without controls.

The scheduling of the Energy Recovery Units shall be controlled through unit and duct mounted temperature sensors, pressure sensors, air flow switches, Variable Frequency Drives, Electronically Commutated Motors and the VRF manufacturer's Centralized Controllers and Expansion Controllers supplied by the VRF manufacturer.

All controls, controllers, piezo rings for the supply and exhaust fans, wiring and interface to the VRF Centralized Controller system for the ERVs shall be furnished and installed by the Automatic Temperature Controls contractor to provide operation as defined by the sequence of operation.

Current transducers shall monitor the operation of the supply and recirculation/exhaust fans in the Energy Recovery Ventilators.

When the unit is disabled the outdoor air intake dampers and the exhaust air dampers shall be closed, the recirculation dampers shall be open, the enthalpy wheel shall be deenergized, the supply and exhaust fans shall be deenergized, the duct mounted humidifier, the duct mounted refrigerant cooling coil shall be deenergized, the remote air cooled condensing unit shall be disabled and the hot water coil control valve shall be closed.

Warm-up

The unit shall be placed in morning warm-up mode as determined by the outdoor air temperature and recovery algorithm. The supply fan and recirculation/exhaust fans shall run subject to the fire alarm system relay and the proper open status of the dampers.

In the Warm-up cycle the cooling shall not run, the supply fan and the recirculation/exhaust fan shall be enabled, the recirculation air damper shall modulate open, and the outdoor intake damper shall be closed, the exhaust air damper shall be closed. The VRF fan coils and associated heat recovery condensing units shall be enabled. The hot water heating coil in the ductwork at the discharge side of the ERV shall modulate open to maintain the leaving air temperature set point of 70°F (adjustable).

When the temperature sensor in the return duct reaches 65ºF (adjustable), the system shall switch to occupied cycle.

Morning Cool Down

In the Cool down cycle the heating shall not run, the supply fan and the supply fan and the recirculation/exhaust fan shall be enabled, the recirculation air damper shall modulate open, and the outdoor intake damper shall be closed, the exhaust air damper shall be closed. The VRF fan coils and associated heat recovery condensing units shall be enabled. The refrigerant cooling coil in the ductwork at the discharge side of the ERV shall be enabled if air flow is proven by the duct mounted air flow switch to maintain the leaving air temperature set point of 78°F (adjustable).

When the temperature sensor in the return air duct reaches set point 78ºF (adjustable) the system shall switch to occupied cycle.

If the outdoor air temperature is 78ºF (adjustable) or above the refrigerant coil if air flow is proven and the associated condensing unit shall be enabled to maintain the discharge sensor temperature sensor set point of 78F (adjustable).

Unoccupied Cycle

In the unoccupied cycle the exhaust air damper shall closed, the enthalpy wheel shall be enabled, the recirculating damper shall open, the outdoor air intake dampers shall be closed, the exhaust/recirculation fan shall be enabled and the supply fan shall be enabled for recirculation of the return air. If the supply air temperature drops below 70°F (adjustable) the hot water heating coil shall be enabled to maintain the discharge temperature set point. In the unoccupied mode the cooling shall be disabled.

Occupied cycle

In the occupied cycle exhaust air damper shall modulate open the outdoor air intake dampers shall modulate open. When the outdoor air intake dampers are fully open the supply fan shall be enabled. When exhaust air dampers are fully open the exhaust fan shall be enabled, the enthalpy wheel shall rotate, and the recirculating damper shall be closed. The supply and exhaust fans shall run as defined by piezometric rings volume controllers located in the supply and exhaust of the units to maintain predetermined air flow offsets of 10% (adjustable) air flows. A discharge air temperature sensor located in the supply ductwork shall monitor the leaving air from the enthalpy wheel. The speed of the wheel shall be modulated to maintain a supply air temperature of 70°F (adjustable) If the speed of the wheel is at maximum (60 HZ at the VFD) after 60 seconds and the supply air temperature remains below the set point the controller shall enable the hot water coil control valve to maintain a discharge air temperature of 70°F (adjustable). If the supply air temperature rises above 78°F (adjustable) and air flow is proven. The outdoor air enthalpy is above the return air enthalpy and the wheel speed is at maximum the stages of refrigerant shall be enabled to maintain supply air temperature set point.

Economizer Operation

If the outdoor air enthalpy is below the return air enthalpy and the discharge air temperature is above 78°F (adjustable) and there is a call for cooling the enthalpy wheel shall modulate its speed to maintain the supply air temperature set point. If the wheel slows to a stop to maintain a supply air temperature between 78°F (adjustable) and 74°F (adjustable) the unit controller shall enable the rotation of the wheel for 15 seconds every 5 minutes.

Alarms

After 60 seconds after the fans are enabled if either fan fails to start the fans shall be disabled, the dampers shall close, a signal shall be sent to the Central Controller.

The cooling coil and remote air-cooled condensing unit shall not be enabled until air flow is proven. If the cooling and remote air-cooled condensing unit are enabled and the supply fan shall stop or not run the refrigerant cooling shall be disenabled and a signal sent to the central controller.

The hot water heating coil control valve shall not be enabled until air flow is proven. If the hot water heating coil control valve is enabled and the supply fan shall stop or not run the hot water coil control valve shall be disabled, close and a signal sent to the central controller.

A low temperature sensor located in the supply ductwork up stream of the heating and cooling coils senses a leaving air temperature of 38°F (adjustable) The supply and exhaust fans shall stop, the outdoor air intake and exhaust air dampers shall close, the recirculation dampers shall open and a signal sent to the central controller. Restart of the unit shall require manual reset.

If the water sensor in either the cooling coil secondary drain pan senses water the Refrigerant condensing unit shall be disabled, and an alarm shall be sent to the central controller.

If the water sensor in either the heating coil secondary drain pan senses water the hot water coil control valve shall close to the coil, and an alarm shall be sent to the central controller.

Humidifiers

The humidifiers shall be controlled by a duct mounted high limit humidistat, an air flow switch, factory supplied controls, a return air humidity sensor, Centralized Controllers and Expansion Controllers supplied by the VRF system manufacturer. Controls and interface to the VRF Centralized Controller system for the humidifiers shall be furnished and installed by the Automatic Temperature Controls contractor to provide operation as defined by the sequence of operation.

The Centralizer controller shall provide scheduling and ON-OFF control of the humidifiers. Normal operation controls shall be provided by the stand-alone humidifier controls.

In general, a humidity sensor located in the return duct prior to the respective Energy Recovery Ventilator shall send a signal to the humidifier to be enabled upon air flow proving by the duct mounted air flow switch. The modulating output of the humidifier shall be determined by the return air humidistat set point of 45% Rh at 68°F (adjustable) and limited by the high limit humidistat.

All humidity sensors shall continuously send their signals to the control cabinet for processing and indication.

If the current exceeds the maximum level, due to warming of the water in the steam generating cylinder, the humidifier shall automatically drain to reduce the current to the set point level.

If the water is of low conductivity, the humidifier will automatically initiate a special low conductivity startup algorithm which will concentrate the minerals to permit output capacity to be reached sooner.

The humidifier shall operate on proportional control, it shall track with the control signal, filling and draining as required to supply the humidity requirements. Tracking with the signal shall be immediate, without delay.

The humidifier shall incorporate "adaptive intelligence" to prevent it from hunting and reduce fluctuations to minimum automatically zeroing to the set point and maintaining precise chemistry control in the steam generating cylinder.

The humidifier shall automatically control the cylinder chemistry to prevent premature plate out of the minerals on the electrodes, and through precise chemical control shall help to keep the drain lines clean. The unit shall indicate when the cylinder is approaching the end of its useful life, but without shutting down.

Alarms

In the event of an alarm condition in the built-in humidifier control system a trouble alarm shall be sent to the central controller.

Upon detection of water in the humidifier drain ban below the steam generating and control unit, the humidifier shall be disabled, the humidifier supply water control valve shall close, the tempering supply water control valve shall close, and an alarm sent to the central controller.

Hot Water Unit Heaters

The hot water unit heaters shall be controlled by a wall mounted heating thermostat. Upon a call for heat the unit heater supply fan shall be enabled. The supply fan shall run to maintain thermostat set point. When the thermostat set point is reached the supply fan shall be disabled.

Existing Hot Water Boiler and Pumps

The existing boilers and pumps shall be controlled by their existing control system the new central controller shall be wired to provide for start stop operation of the boilers and pumps. Controls and interface to the VRF Centralized Controller system. for the boilers and pumps shall be furnished and installed by the Automatic Temperature Controls contractor.

Copy Room 250 Exhaust Fan EF-1

The exhaust fan shall be controlled by a wall mounted cooling thermostat. Upon a call for cooling the exhaust fan shall be enabled. The fan shall run to maintain the thermostat set point. When the set point is reached the fan shall be disabled.

Air Purification Systems

The air purification system shall operate on its own manufacturer supplied controls and the VRF Centralized Controller System.

In general, the air purification system shall be enabled through the factory supplied, built-in air flow sensor and the Centralized Controller when the respective fan coil unit or Energy Recovery Ventilator is enabled to run.

The new central controller shall be wired to provide for start stop operation of the air purification systems. Controls and interface to the VRF Centralized Controller system. for the air purification systems shall be furnished and installed by the Automatic Temperature Controls contractor

PART 3: EXECUTION

3.01 FINAL REVIEW 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, the HVAC Contractor shall submit a letter signed by an officer of this contracting company or an officer of the general contractor 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. The HVAC Contractor shall arrange that an officer of this contracting company, as well as the Designer, in addition to other test witnesses that may be specified, shall witness the below listed tests. After each such test the HVAC 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.

D. Tests Requiring Letters

1. Functional test of the following
    a. Automatic Temperature Controls
    b. Variable Refrigerant Flow fan coil units.
    c. Variable Refrigerant Flow condensing units.
    d. Ductwork
    e. Direct Expansion Cooling/heating coils and associated condensing units.
    f. Hot water heating coils.
    g. Energy recovery ventilators
    h. Humidifiers
    i. Condensate and Humidifier drain piping.
    j. Refrigerant piping.
    k. Hot water heating piping
    l. Exhaust fans
    m. Hot water unit heaters.

3.02 INSTALLATION

A. The HVAC systems and all associated work shall be furnished and installed in accordance with all specified codes for the service intended.

B. It is the intent of the Specifications and accompanying Drawings that the systems shall be furnished and installed complete.

C. The HVAC Contractor shall furnish and install all piping, Energy Recovery Ventilators, VRF condensing units and Fan Coils, Split System Condensing Units, Unit Heaters, ductwork, air intakes, air exhausts, insulation, valves, equipment, devices and controls needed and usually furnished in connection with such work whether specifically mentioned or not.

D. The work shall be carried on under the usual conditions affecting construction of the type involved, and in conjunction with other operators at the site. The HVAC Contractor shall cooperate with the Designer and all Sub-Contractors working on the site. He shall coordinate his work with theirs and shall proceed in such a manner as not to delay or hinder in any way the progress of the work as whole. In case of dispute, the Designer shall render a decision, which shall be final.

E. The HVAC Contractor shall secure instructions from the Owner as to space for storing materials and tools and shall keep and remove all debris, unused materials and equipment from the premises as promptly as possible.

F. Piping shall be kept 6" away from parallel runs of electric wiring. Piping, and equipment shall be supported and secured at proper intervals. Exposed piping shall have runs installed parallel or perpendicular to walls, structural members of runs shall be made with symmetrical bends. Crushed or deformed piping shall not be installed.

G. Care shall be taken to prevent the lodgment of plaster, dirt, or trash in piping, ductwork, valves fittings and equipment during construction. Clogged equipment and/or material shall be entirely freed of obstruction or shall be replaced.

H. Wooden plugs inserted in concrete are not acceptable as a base for piping fastenings. Piping shall be secured by pipe straps or shall be supported by wall brackets, strap hangers, or ceiling trapeze, fastened by wood screws on wood, expansion bolts on concrete or brick and machine screws or welded threaded studs on steel work.

I. Flexible connections of short length shall be provided for motors and equipment subject to vibrations or movement.

J. Access panels, if required for HVAC work, shall be furnished by the HVAC Contractor for installation.

K. The HVAC Contractor shall consult all Contract Drawings, which may affect the location of any outlets, apparatus and equipment to avoid all possible interference and permit full coordination with all work. The right to make any reasonable change in location to outlets, apparatus or equipment up to the time of roughing-in, is reserved to the Designer, and such changes shall be made without additional cost to the Owner.

L. It shall be the responsibility of the HVAC Contractor to see that all HVAC equipment is made accessible, such as dampers, control and such other apparatus as may require maintenance and operation from time to time.

3.03 WORKMANSHIP

A. All work shall be executed in a workmanlike manner and shall present a neat and professionally done appearance.

B. All pipes shall be run parallel or perpendicular to building grid lines and shall be properly graded.

C. All pipe connections shall be made in a manner, which will allow for freedom of movement during expansion and contraction.

D. Swing joint, expansion loops and expansion joints with proper anchors required to provide flexibility, they shall be provided as if they were shown, at no additional cost to the Owner.

3.04 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other trades in executing work of this Section.

1. Perform work such that progress of entire project including work of other trades shall not be interfered with or delayed.

2. Provide information as requested on items furnished under this Section which shall be installed under other trades.

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 trades.

5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other trades. 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 the 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 the Designer of location and extent of existing piping, ductwork and equipment that interferes with new work. In coordination with and with approval of the 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 the Designer. Dispose of or store items as requested by the Designer.

B. Installation Only Items

1. Where the HVAC 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.

C. The HVAC 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 the HVAC Contractor will

be considered only if presented in writing within one week of their date of delivery. Unless such claims have been submitted the HVAC Contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.

D. 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.

E. Use of premises:

1. Use of premises shall be restricted as directed by the Owner and as required below. In general access to the building during normal business hours. Access outside normal business hours needs to be coordinated with the Owner.

2. Building is to be provided with uninterrupted heating during construction as specified in Section 1.28 HEATING DURING CONSTRUCTION

a. 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 the Owner and as specified under CLEANING paragraph.

b. 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.

c. 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 the Owner and 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 Owner to provide minimal interference with normal operation. Obtain the Designer’s approval of the method proposed for minimizing service interruption.

F. 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 the Designer in writing and do not proceed with work until written instructions have been issued by the Designer.

G. Coordinate work under this Section with progress of construction so that permanent heating system will be ready to provide temporary heating if permitted by the Designer.

H. 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 the Owner Project Manager.

3.05 CONTINUITY OF SERVICES

A. Do not interrupt existing services without the Owner’s approval.

B. Access at the end of the workday shall be coordinated with the owner.

C. Temporary heat shall be provided in accordance with Section 1.27 of these specifications.

3.06 AUTOMATIC TEMPERATURE CONTROLS SYSTEM INSTALLATION

A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

B. Line and low voltage electrical connections to control equipment shown specified shall be furnished and installed by the HVAC Contractor in accordance with these specifications.

C. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the HVAC Contractor.

D. Wiring

1. All electrical control wiring and components shall be the responsibility of the HVAC Contractor.

2. The electrical contractor shall furnish all power wiring to electrical starters and motors.

3. All wiring shall be in accordance with the National Electrical Code and any applicable local codes.

E. Warranty

1. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

2. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by the HVAC Contractor at no expense to the Owner

F. Acceptance Testing

1. Upon completion of the installation, the HVAC Contractor shall start-up the system. The HVAC Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to ensure that the system is functioning in full accordance with these specifications.

2. The HVAC Contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results

3. System Acceptance: Satisfactory completion is when the HVAC Contractor and the Electrical contractor have performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

G. Operator Instruction, Training

1. The HVAC Contractor shall provide 4 hours of instruction to the owner's designated personnel on the operation of the automatic temperature control systems.

3.07 EQUIPMENT BASES AND HANGERS

A. The HVAC Contractor shall provide metal bases, hangers and supports not part of the building for all equipment and erect all structural supports of proper size, type and

strength throughout the work wherever necessary. Concrete bases for condensing units outside the building shall be furnished and installed under Section 03 3000 of the specifications. This work and material shall be complete and must be approved by the Designer.

3.08 PROTECTION

A. The HVAC Contractor shall take particular care to protect any finished work from injury caused thereto by his operations or the operations of any other Contractors.

B. The HVAC Contractor shall provide suitable protection of all equipment furnished under this Contract while stored at the job site and after installation. This protection shall be suitable to guard equipment items against damage from the weather or from construction activity. Such protection shall not be removed until directed by the Designer. The interior and exterior of all ducts, piping and equipment shall be kept in a clean condition, free from dirt and debris. All piping, duct and equipment items shall be thoroughly cleaned before the start-up of any equipment or system.

3.09 OPERATIONAL EQUIPMENT TESTS

A. Tests: No tests shall be started until systems have been cleaned. If leaks develop, repairs shall be made, and tests repeated. Tests shall be continued until systems operate without adjustments and repair to equipment, ductwork or piping. Tests are further specified under other paragraphs of this Section. Test requirement specifically includes, but is not limited to the proper operation of the following:

a. Automatic Temperature Controls
b. Variable Refrigerant Flow fan coil units.
c. Variable Refrigerant Flow condensing units.
d. Direct Expansion Cooling coils and associated condensing units.
e. Hot water heating coils.
f. Energy recovery ventilators
g. Exhaust Fans
h. Humidifiers
i. Hot water unit heaters.

3.10 PIPING SYSTEMS TESTING

A. Interior Condensate Drain Systems

1. Water test shall be applied to these condensate drainage systems, in sections, as required, after rough piping has been installed. Each opening shall be tightly closed, except the highest opening in the section under test, and each section shall be filled with water, but no section shall be tested with less than a 10' head of water. In testing successive sections, at least the upper 10' of the next preceding section shall be tested so that no point of pipe in the building (except the uppermost 10' of the system) shall be submitted to a test of less than 10' head of water. The water shall be kept in the system for at least 30 minutes before inspection starts; the system shall then be made tight at all points.

2. Any points of the condensate drainage systems to be tested with air instead of water shall be made by attaching an air compressor testing apparatus to any suitable opening and after closing all other inlets, forcing air into the system until there is a uniform gauge pressure of 5 psi or sufficient to balance a column of mercury 10" high. This pressure shall be held without the introduction of additional air for a period of at least 30 minutes.

B. Refrigerant Pipe Testing

1. After installation test refrigerant piping in accordance with the manufacturer's instructions. In general:

   a. Make sure all service valves are closed

   b. Add pressure to the refrigerant piping using dry nitrogen through the service ports of the high and low pressure pipes up to the design pressure as dictated by the manufacturer's installation data.

   c. If the pressure holds for 24 hours and does not decrease. If the pressure decreases, look for leaks by spraying a bubbling agent on the flared or brazed sections. Wipe off the bubbling agent repair the leak and perform the test again.

   d. Charging the refrigerant piping systems shall be done in accordance with the manufacturer's installation data. In general, the procedure shall include:

   e. For the VRF system the triple evacuation method shall be used (see manufacturer's installation data.

   f. Evacuation of the refrigerant piping using a vacuum pump with a check valve to eliminate the possibility of vacuum pump oil ente3ring the refrigeration system. When the system pressure reaches 0 PSI continue vacuum for at least one hour.

   g. Stop the vacuum pump and let the system stand for one hour.

   h. Verify that the vacuum has not changed.

   i. If the vacuum has changed repeat the test.

2. Test refrigerant systems for refrigerant and air leaks least twice after the system has been in operation: approximately six months start-up and at the end of the guarantee period.

   a. Use an electronic refrigerant detector for leak detection.

   b. Leaks detected shall be properly sealed and the above test repeated.

   c. Test pressures shall be as indicated in the operational data provided by the manufacturer.

   d. Replace refrigerant oil lost during guarantee period at no cost to the owner.

   e. Certify condition of system in writing after test.

C. Testing of Hot Water Heating Piping

1. Hydrostatic Test of Hot Water Heating Piping

   a. Testing medium shall be water at ambient temperature.

   b. When designated test pressure is applied, connections shall be inspected by designer's representative for acceptance.

   c. Leaks discovered during testing shall be repaired at no cost to the owner; retest system.

   d. Isolate system piping from system components during testing.

   e. Before test, piping shall be cleaned and flushed as required under CLEANING paragraph.

f. Test pressurized piping system to 125 psi for one hour. If the test pressure decreases examine the piping system for leaks. Repair leaks and retest the system.

D. When testing is complete certify satisfactory completion of the testing. Make multiple copies of the certification and deliver the certifications to the designer.

3.11 DUCT SYSTEMS TESTING

A. First, a visual inspection of all joints in the entire system shall be made and all leaky joints shall be replaced and made airtight.

B. After the visual inspection, all systems shall be tested at full system static pressures by operating the supply fans in accordance with SMACNA "HVAC Duct Leakage Test Manual." Special attention shall be given to small leaks that may be present in headers, run outs and risers. The leaks shall be sealed airtight to stop noise.

C. No less than 25% of the new duct systems shall be leak tested in accordance with the SMACNA HVAC Air Duct Leakage Manual Second Edition Chapter 5 Section 5.1 and the 2018 International Energy Conservation Code (IECC) Section 403.11.2. The maximum air leakage shall be no greater than 4 CFM/100 square feet of ductwork as indicated in the IECC.

D. All holes or damaged portions of the ductwork shall be repaired or replaced to prevent loss of air. All tests shall be conducted in the presence of the Balancing Professional Engineer. All repairs must be done in a manner satisfactory to the Designer.

E. The Contractor shall guarantee the entire installation of the duct systems to function satisfactorily against the specified system total static pressure. Defects due to improper materials, workmanship, and leaks shall be corrected without additional cost to Owner. Other work affected as a result of the above mentioned shall also be made good without cost to the Owner. The entire system shall be left in proper operation condition, acceptable to the Designer.

3.12 CLEANING

A. HVAC air-distribution system cleaning. After construction the duct systems, new piping and equipment shall be cleaned as indicated herein.

1. UL Compliance: Comply with UL 181.
2. Comply with NADCA ACR 2006.
3. Remove visible surface contaminants and deposits from within the HVAC system.
4. Systems and Components to be cleaned:
5. Air outlets and inlets for supply, exhaust and return air.
6. Exhaust fans, louvers and dampers
7. Supply-air ducts, including turning vanes, from the outlets to the air-handling unit.
8. Return-air ducts to the air-handling unit.
9. Exhaust-air ducts.
10. Interior surfaces of the unit casing.
11. Condensate drain pans.
12. Fans, fan blades, and fan housings.

13. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process.

14. Particulate Collection:

    a. For particulate collection equipment, include adequate filtration to contain debris removed. Locate equipment downwind and away from all air intakes and other points of entry into the building.

    b. HEPA filtration with 99.97 percent collection efficiency for particles sized 0.3 micrometer or larger shall be used where the particulate collection equipment is exhausting inside the building,

15. Control odors and mist vapors during the cleaning and restoration process.

16. Mark the position of manual volume dampers and air-directional HVAC devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.

17. System components shall be cleaned so that all HVAC system components are visibly clean. On completion, all components must be returned to those settings recorded just prior to cleaning operations.

18. Clean visible surface contamination deposits according to NADCA ACR 2006 and the following:

19. Airstream surfaces and components.

B. Duct Systems:

1. The HVAC Contractor shall create service openings in the HVAC system as necessary to accommodate cleaning. After cleaning has been completed the HVAC Contractor shall patch openings previously made to facilitate cleaning.

2. A contract agreement satisfactory in form and substance to the Owner shall be executed between the HVAC Contractor and the Duct Cleaning Sub-contractor through its authorized agents binding the Duct Cleaning Sub-contractor to provide supervisory service to assure the use of proper cleaning of the new and existing duct systems, as hereinafter described in these Specifications. The Duct Cleaning Sub-contractor shall perform the following service.

    a. Mechanically clean duct systems specified to remove all visible contaminants so that the systems are capable of passing the HVAC System Cleanliness Tests (see NADCA ACR 2006).

    b. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.

1. HVAC Cleaning Methodology:

    a. Source-Removal Cleaning Methods: The HVAC system shall be cleaned using source-removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and to safely remove these contaminants from the facility. No cleaning method, or combination of methods, shall be used that could potentially damage components of the HVAC system or negatively alter the integrity of the system.

    b. Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.

c. Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials such as duct and plenum liners.

2. Cleaning Mineral-Fiber Insulation Components:

a. Fibrous-glass thermal or acoustical insulation elements present in equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the HVAC system is under constant negative pressure and shall not be permitted to get wet according to NADCA ACR 2006.

b. Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests (see NADCA ACR 2006).

c. Fibrous materials that become wet shall be discarded and replaced.

C. Hot Water heating Piping

1. Provide the necessary apparatus to provide cleaning of the new and existing piping installed under this contract. The Town has a chemical treatment company under a maintenance contract:

Mr. Ben Petron Account Manager
The Metro Group, Inc.
64 Cummings Park
Woburn, MA 01801

Telephone: (781) 932-9911

2. A contract agreement satisfactory in form and substance to the Owner shall be executed between the HVAC Contractor and the Water Treatment Sub-contractor through its authorized agents binding the Water Treatment Sub-contractor to provide supervisory service to assure the use of proper chemical cleaning and flushing of the new piping systems, as hereinafter described in these Specifications. The Water Treatment Sub-contractor shall perform the following consulting analysis service.

3. Supervise the cleaning and flushing out of the new hot water heating piping system.

4. Automatic flow control valves, and all similar devices, in which foreign matter could become lodged, shall not be installed until cleaning and flushing is completed.

5. After completing the installation or modification of the hot water heating piping, it shall be properly flushed out prior to start up. Flush out chemicals and procedures shall be furnished by the Water Treatment Sub-contractor.

6. Tests shall be made following the flush out and refilling procedure and a written report submitted to the Designer and Owner and stating that the flushing out has been completed satisfactorily.

7. All side loops and low points shall be drained and flushed.

8. The newly installed hot water piping shall be thoroughly flushed and cleaned with Dearborn BC-45 Cleaner, Dow, Barclay or as determined by the Water Treatment Sub-Contractor.

D. Heating Piping Equipment

1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.13 DUCTWORK AIR BALANCING

A. Air Balancing in General

1. Air balancing of the Duct Mounted Smoke Detectors, Energy Recovery Ventilators, Fan Coil Units and Exhaust Fans in the building shall be part of the HVAC Contractor's scope of work.

2. Balancing and adjusting of the air systems shall be performed only by a qualified firm approved by the Designer and which specializes in air balancing and can show a specific record of having balanced other systems of similar size and complexity and which has been in business for at least five years.

3. All air systems shall be balanced as specified hereinafter.

4. Before the systems are tested and balanced, ducts and equipment shall be thoroughly cleaned so that no dirt, duct, or other foreign matter will be deposited in or carried through the systems. For this purpose, cheesecloth shall be placed over each opening for entraining such particles during the cleaning operation.

5. Energy Recovery Ventilators, and Fan coil units shall not be operated without filters in place. All filters shall be replaced after air systems have been cleaned and ready for system balancing.

6. The HVAC contractor as a part of his contract shall provide all materials, labor and service of the balancing contractor for fulfillment of air balancing of all new Energy Recovery Ventilators and associated duct supply, outdoor air intake, return and exhaust systems. The balancing contractor shall inform the HVAC contractor of all requirements ahead of time.

7. Upon completion the entire system installed must be balanced to provide the flows indicated on the drawings. The method of balancing and checking shall meet the approval of the Designer.

8. The procedures used for air balancing shall be in conformance with the "Procedural Standards for Testing, Adjusting, Balancing of Environmental System", seventh edition published by the National Environmental Balancing Bureau or the "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", fifth edition published by the Associated Air Balance Council. A copy of the standards must be maintained on site by the Balancing Sub-contractor at all times. The test report forms shall comply with the formats listed in these standards.

9. Submit qualifications of firm and individuals, forms, certifications, specific records of similar systems, years in business and listing of equipment to be used on the project for approval by the Designer.

B. Air Systems

1. Systems shall be adjusted and balanced so that air quantities at outlets are as directed and so that the distribution from supply outlets is free from drafts and uniform over the face of each outlet.

2. Adjustments shall be made to volume dampers close to air outlets to produce the least pressure drop consistent with volume requirements. Primary balancing shall be obtained by adjustment of the dampers at branch duct take offs.

3.14 WATER BALANCING

A. General

1. Prior to demolition the HVAC Contractor shall engage the Balancing Contractor to audit the water flow through the existing to remain heat output devices and log the data for balancing after the project construction is completed and water balancing of the hot water heating system is commenced.
2. Balancing of the new and existing hot water heating piping system including but not limited to new hot water unit heaters and hot water heating coils, existing cabinet heaters, unit heaters, fin tube, boilers and pumps shall be part of the HVAC Contractor's scope of work.
3. Balancing and adjusting of the heating hot water systems shall be performed only by a qualified firm approved by the Designer and which specializes in air and water balancing and can show a specific record of having balanced other systems of similar size and complexity and which has been in business for at least five years.
4. All water systems listed in paragraph above shall be balanced as specified hereinafter.
5. Before the systems are tested and balanced, pipes and equipment shall be thoroughly cleaned so that no dirt, dust, or other foreign matter will be deposited in or carried through the systems.
6. The HVAC Contractor as a part of his contract shall provide all materials, labor and service of the balancing contractor for fulfillment of air and water balancing of all systems. The balancing sub-contractor shall inform the HVAC Contractor of all requirements ahead of time.
7. Upon completion the entire system installed must be balanced to provide the flows indicated on the drawings. The method of balancing and checking shall meet the approval of the Designer.
8. The procedures used for water and temperature balancing shall be in conformance with the "Procedural Standards for Testing, Adjusting, Balancing of Environmental System", seventh edition published by the National Environmental Balancing Bureau or the "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", fifth edition published by the Associated Air Balance Council. A copy of the standards must be maintained on site by the Balancing Sub-contractor at all times. The test report forms shall comply with the formats listed in these standards.
9. Submit qualifications of firm and individuals, forms, certifications, specific records of similar systems, years in business and listing of equipment to be used on the project for approval by the Designer.

B. Water Systems

1. Note: Balancing valves and associated water systems balancing shall not be required on devices where Belimo Pressure Independent Control Valves (PICCV) are installed. Balancing valves and balancing are required if self-contained pressure independent control valves are not installed.

2. Temperature control valves shall be wide open during the balancing. Adjustment of water flows through boilers shall be based on manufacturer's pressure drop data. Balancing cocks and valves shall be set. If this results in excessive total flow, this shall be corrected by partial closing of pump discharge valves during further adjusting and balancing. The settings of cocks, valves, etc., shall be permanently marked so that they can be restored if disturbed at any time.

3. After completion of the balancing and adjusting of the water systems, six copies of a report showing the following information shall be submitted for review and approval. The following shall be established:

4. Temperatures and water flow at each boiler after each complete system has been balanced and adjusted.

5. Pressure drops, manufacturer's ratings, and water flow at each boiler after each complete system has been balanced and adjusted.

6. The balancing contractor shall provide all instruments and accessories required to perform the tests

3.15 HANGERS AND SUPPORTS

A. Hangers shall support piping from building structure to maintain required grade and pitch of pipelines, prevent vibrations secure piping in place, and provide for expansion and contraction. Provide locknuts on all hangers and supports. Hangers shall be secured to inserts wherever practical. Set inserts before concrete is placed.

B. Hangers shall be adjustable clevis hanger type. Hanger rods shall have machine threads. Hangers shall be Grinnell Figure 260 for ferrous piping and Figure CT-6i5 for copper tubing. Piping 3" and larger shall be roll type equal to Grinnell Figure 181 with insulation protection saddle.

C. Support horizontal piping as indicated on the Drawings.

D. Approved type trapeze hangers made up of angles bolted back-to-back, or channels may be used instead of separate hangers where several parallel pipes occur.

E. Provide metal covering shields on hangers for insulated water piping to protect covering. Shield shall be entirely outside insulation with no contact with piping. Support vertical piping at every floor level by heavy iron extension pipe clamps, having bolts on each side, and ends having equal bearing on structure. Support base of vertical piping by hanger placed on horizontal branch close to riser or base fitting set on foundation. Riser clamps for ferrous piping shall be Grinnell Figure 261, and Figure CT-121 for copper tubing.

F. Provide approved material between iron supports and copper or brass piping to prevent reaction between metals.

G. Shooting of inserts into concrete will not be allowed without approval of Designer.

H. Hangers shall be supported from overhead precast concrete by means of “T” hangers as manufactured by Fehr Brothers.

I. Pipes along walls shall be supported by means of L-shaped brackets and secured to the masonry walls by means of all metal expansion shields and bolts.

J. The use of wood or fiber plugs for any purpose in any part of the work shall not be permitted nor will hangers formed by means of chains, wires, perforated steel bands or horizontal pieces of pipe be allowed.

3.16 TEMPORARY OPENINGS

A. HVAC Contractor shall ascertain from his examination of the Drawings, whether any special temporary openings in the building for the admission of apparatus furnished under this Contract will be necessary. He shall notify the Designer in writing accordingly.

3.17 SHIMS AND ANCHOR BOLTS

A. The HVAC Contractor shall provide all shims and grouting, and he shall provide all templates and anchor bolts required for the complete installation of items furnished by him.

B. The HVAC Contractor shall be responsible for the locations of all anchor bolts and other items embedded in the masonry and concrete.

3.18 EXPANSION

A. Make all required provisions to prevent damage to pipe caused by expansion or contraction of pipelines.

B. Provide expansion joints or expansion loops where indicated on Drawings and/or required to prevent damage to pipe cause by expansion and contraction in the piping system.

C. Installation of expansion joints shall conform to manufacturer's recommendations. Do not alter the lengths of the expansion joints during installation.

D. Where expansion joints are in concealed locations, make access provisions to permit inspection, servicing and replacement as required.

3.19 PROTECTION

A. The HVAC Contractor shall take care to protect any finished work from injury caused thereto by his operations or the operations of any other Contractors.

B. The HVAC Contractor shall provide suitable protection of all equipment furnished under this Contract while stored at the job site and after installation. This protection shall be suitable to guard equipment items against damage from the weather or from construction activity. Such protection shall not be removed until directed by the Designer. The interior and exterior of all ducts, piping and equipment shall be kept in a clean condition, free from dirt and debris. All piping, duct and equipment items shall be thoroughly cleaned before the start-up of any equipment or system.

3.20 ESCUTCHEONS

A. Escutcheons shall be installed around all exposed pipe passing through finished floors, walls, or ceilings.

B. Escutcheons shall be heavy cast brass, chromium plated, adjustable and of sufficient outside diameter to cover sleeve opening and fit snugly around pipe.

3.21 RECORD DRAWINGS

A. The Owner will provide CAD files to HVAC Contractor to maintain and submit record drawings, one (1) set of which shall at all times, be accurately, clearly and completely shown the actual installation in accordance with requirements of this Section.

B. Wherever the work was installed other than as shown on the Contract Drawings, said changes shall be indicated on the "As-Built" prints. Any addenda sketches and supplementary drawings issued during the course of construction shall also be incorporated on the "As-Built" prints.

1. The "As-Built" drawings shall be kept up-to-date and be available to the Owner and Designer for inspection at all times. The up-to-datedness of "As-Built" drawings shall be prerequisite in the approval of each Contractor's application for payment.
2. At the completion of the Contract, the HVAC Contractor shall submit an accurately drawn and checked set of "As-Built" drawings, on AutoCAD Release 2016 or higher, to the Designer for approval.

C. All cost related to "Record Drawings" shall be paid for the HVAC Contractor.

3.22 OPERATING AND MAINTENANCE MANUALS

A. All operating equipment installed under this section shall be placed in operation and shall function continuously in an operating test for a period of one week without shutdown due to mechanical failure or necessary adjustment.

B. Prior to scheduling the Project Final Inspection and after completion of all installation and running adjustments, the HVAC Contractor shall perform all work required to place the equipment in complete operating condition to meet all requirements under this specification.

C. During this running test period, the HVAC Contractor shall deliver to the designated representative of the Owner, two complete sets of operating, service and replacement data for all equipment, which will require operating maintenance or replacement. One copy of this literature shall be available during the instruction of the operating personnel while the other is checked for completeness by the Owner. During all working hours of the "one-week operating test", the HVAC Contractor instruction personnel shall be available for and provide thorough and detailed training to the Owner's operating and maintenance personnel in operation, maintenance and adjustment of all equipment installed.

D. The HVAC Contractor shall give sufficient notice to the designated personnel of the Owner in advance of this period. Upon completion of instruction, obtained from such representatives written verification on that which the above-mentioned instruction has been performed; such verification shall be forwarded to the Owner.

E. Operating Manual: Upon completing the work, provide the Owner with six copies of the approved operating manual containing approved shop drawings, and details, and typewritten instructions relative to the care and operation of the equipment, all properly indexed and bound in hard-back, three-ring binders. The manual shall have the following contents.

1. Table of Contents:
2. Introduction:
3. Explanation of Manual and its use
    a. Description of Variable Refrigerant Flow fan coil units.
    b. Description of Variable Refrigerant Flow condensing units.
    c. Description of Direct Expansion Cooling/heating coils and associated condensing units.
    d. Description of Hot water heating coils.
    e. Description of Energy recovery ventilators
    f. Description of Humidifiers
    g. Description of Exhaust fans

h. Description of Hot water unit heaters.

4. Maintenance:

a. Maintenance and Lubricating Chart:

1) Furnish three sets of charts indicating equipment tag number, location of equipment, equipment service, greasing and lubricating requirements as recommended, lubricants and intervals of lubrication. One chart shall be framed under glass and mounted in the Mechanical room.

b. Recommended List of Spare Parts:

1) Furnish two typed sets of instructions for ordering spare parts with sectional views of the fittings or equipment showing part numbers or labeled to facilitate ordering replacements. Each set shall include a list with itemized prices of those parts recommended to be kept on hand as spares, as well as the name and address of where they may be obtained.

5. Manufacturer's Literature:

a. Motors

b. Building Temperature Control System

c. Variable Refrigerant Flow fan coil units.

d. Variable Refrigerant Flow condensing units.

e. Direct Expansion Cooling/heating coils and associated condensing units.

f. Hot water heating coils.

g. Energy recovery ventilators

h. Humidifiers

i. Exhaust fans

j. Hot water unit heaters.

6. Written Guarantee:

a. Refer to paragraph 1.11

3.23 RUBBISH REMOVAL AND CLEANING

A. At the completion of each day's work, the HVAC Contractor shall remove from the premises all rubbish or waste material belonging to him.

B. At completion all piping systems shall be cleaned and rodded, all fixtures cleaned, and polished and all other HVAC equipment cleaned.

END OF SECTION

26 00 00 – ELECTRICAL

[FILED SUB-BID REQUIRED]

PART 1 - GENERAL

1.1 FILED SUB-BIDS

A. Electrical is stipulated as a Filed Sub-Bid under Part B, Item 2, of the FORM FOR GENERAL BID.

B. All sub-bids shall be submitted on the FORM FOR SUB-BID furnished by the Awarding Authority as required by Section 44G of Chapter 149 of the General Laws, as amended.

C. Sub-bids must be filed with the Awarding Authority in a sealed envelope, before the time stipulated on the ADVERTISEMENT, on the date stipulated in the ADVERTISEMENT.

D. Specific information relating to sub-bidders is set forth in the CONTRACT DOCUMENTS under the heading, “NOTICE TO ALL BIDDERS”, and the attention of the sub-bidders is directed thereto.

E. The work to be done under this Section 26 00 00 is described herein, and on “E” series Drawings.

1.2 RELATED DOCUMENTS

A. Include GENERAL CONDITIONS, SUPPLEMENTARY GENERAL CONDITIONS and applicable parts of Division 01 as part of this Section.

B. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. All Drawings and the provisions of Division 01 of the Specifications apply to this Section. In addition, other portions of the Specifications should be consulted for various coordination purposes. Also, attached panel schedules shall be included along with the plans and specifications, as part of this contract.

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. 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. Remove all debris caused by work.

1.3 RELATED SECTIONS

A. Section 21 00 00 – Fire Protection

B. Section 22 00 00 – Plumbing

C. Section 23 00 00 – Heating, Ventilating and Cooling

1.4 LOCATION

A. The Work of this Contract shall be performed at the Boxford Town Hall, 7 Spofford Rd, Boxford, Massachusetts.

1.5 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary to provide complete electrical systems and general contracting work, as shown on the drawings and as specified herein.

B. Furnish all labor and materials to perform demolition work as shown on the Drawings, as required for the installation of new work, and as specified hereinafter.

1.6 DESCRIPTION OF WORK

A. Interior renovations to the entire first floor including all lighting, power, fire alarm and low voltage system work.

B. Work shall include, but shall not be limited to, the following:

1. Interior exit signs and emergency lighting units (EBU's).
2. Addition of one new panel.
3. Modifications to existing panels (provide new circuit breakers)
4. All receptacles and power required for the work of other trades.
5. Modifications to the existing fire alarm system, tie-in new fire alarm devices and relocate existing devices.
6. Conduit and raceways.
7. New and relocated lightings and switch controls
8. Wire and cable.
9. Branch circuit wiring.
10. Wiring devices and plates.
11. Sleeving.
12. Pull boxes and cable troughs.
13. Building system grounding.
14. Supervision and approval.
15. Electrical connections to HVAC and Plumbing equipment, and other equipment provided under other Sections or by Owner.
16. Nameplates, labels and tags.
17. Testing.
18. Operating and maintenance instructions and manuals.
19. Coordination drawings and shop drawings.

C. Install the following items furnished under other Sections or by Owner: Starters furnished under Division 23.

1.7 DEFINITIONS

A. The following definitions apply to the Drawings and Specifications;

1. Furnish: The term “furnish” is used to mean “supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.”
2. Install: The term “install” is used to describe operations at project site including actual “unloading, unpacking, rigging in place, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.”
3. Provide: The term “provide” means to “furnish and install, complete and ready for intended use.”
4. Installer: An “installer” is the contractor or an entity engaged by the contractor, either as an employee, subcontractor, or sub-subcontractor for a performance of a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1.8 CONTRACT DOCUMENTS.

A. Work to be performed under this Section is shown primarily on the Electrical Drawings.

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. 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.

1.9 DISCREPANCIES IN DOCUMENTS

A. Address questions regarding drawings to Architect in writing before award of contract; otherwise, Architect’s interpretation of meaning and intent of drawings shall be final.

1.10 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 notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction. Utility fees excluded.

D. All electrical apparatus furnished under this section shall be approved by the U.L. and shall be so labeled or listed where such is applicable. Where custom-built equipment is specified and the U.L. label or listing is not applicable to the completed product, all components used in the construction of such equipment shall be labeled or listed by U.L. where such is applicable to the component.

E. Give notices, file plans, obtain permits and licenses, pay fees and obtain necessary approvals from authorities having jurisdiction. Deliver certificates of inspection to Architect. No work shall be covered before examination and approval by Architect, 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.

1.11 GUARANTEE

A. Guarantee work in writing for one year from date of substantial completion. 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 guarantee to Architect before final payment.

C. Statement of guarantee requirements shall not be interpreted to limit Owner’s rights under law and this contract.

1.12 PROTECTION OF MATERIALS, WORK, AND GROUNDS

A. Materials, fixtures and equipment shall be properly protected and all 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.

1.13 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 Architect before being

installed. The Contractor shall follow Drawings, including his shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Architect before proceeding with the installation. The 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 shafts and conduits and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. 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 conduits.

1.14 RECORD DRAWINGS

A. Maintain record drawings on site. Record set shall be complete and current and available for inspection when requisitions for payment are submitted.

1.15 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. 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.

C. Schedule at least ten working days, exclusive of transmittal time for submittal review.

D. Material and equipment requiring Shop Drawing and Product Data submittal shall include but shall not be limited to:

1. Panels
2. Lighting fixtures including lamps and fuses as required.
3. LED Drivers.
4. Conduit and raceways.
5. Wire and cable.
6. Wiring devices and plates.

E. Furnish items for installation under other Sections or by Owner, and wire as required: Fire protection water flow switches and excess pressure pump kit for installation as specified in Division 23.

F. Install the following items furnished under other Sections or by Owner: Starters, except starters in motor control centers, furnished under Division 23.

G. Provide items for equipment installed under other Sections or Contracts or by Owner.

1.16 SUBSTITUTIONS

A. Deviations from contract documents or proposed substitution 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.

B. If materials or equipment are substituted for specified items that alter the systems shown or its physical characteristics, or which have different operating characteristics, clearly note the alterations or difference and call it to the attention of the a/e. Under no circumstances shall substitutions be made unless material or equipment has been successfully operated for at least three consecutive years.

C. Any modifications to the design, as a result of approving a substitution, shall be the responsibility of this contractor. Any additional cost to this contractor or any other contractor, directly or indirectly, as a result of such substitutions, shall be the responsibility of this contractor.

1.17 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide in accordance with Division 01 for all equipment provided in this section.

1.18 UNDERWRITERS' LABEL AND LISTING

A. All electrical apparatus furnished under this Section shall be approved by the UL and shall be labeled or listed where such is applicable. Where custom-built equipment is specified and the UL label or listing is not applicable to the completed product, all components used in the construction of such equipment shall be labeled or listed by UL where such is applicable to the component.

1.19 CUTTING AND PATCHING

A. All cutting and patching one (1) square foot and less in area necessary for the proper installation of work to be performed under this Section and subsections shall be performed by the Electrical Sub-Contractor. All cutting and patching associated with demolition work and greater than one (1) square foot in area for the installation of work under this section shall be by the General Contractor.

B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.

C. The contractor shall see that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and shall consult with the Architect in reference to this work. In so doing, he shall 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 Architect.

D. Carefully fit around, close up, repair, patch, and point around the work specified herein to the entire satisfaction of the Architect.

E. Fill and patch all openings or holes left in the existing structures by the removal of existing equipment by himself, his subcontractors or other filed subcontractors.

F. All of this work shall be carefully done by workmen competent to do such work and with the proper and smallest tools applicable.

G. Any cost caused by defective or ill-timed work shall be the contractor's responsibility therefore.

H. The fire resistance rating of floors, walls, and ceilings shall be maintained. UL listed firestopping shall be installed in accordance with manufacturer's written instructions. Electrical Contractor shall refer to Division 07 of the specifications for fire stopping requirements.

1.20 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 therefrom 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.

E. Remove walls, window assemblies/glass and floor structures where necessary to install and remove equipment as shown. The Contractor shall reinstall such displaced structures to their original condition.

1.21 STANDARDS

A. The latest published issue of the 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.	UL	Underwriters' Laboratories, Inc.
2.	ANSI	American National Standards Institute
3.	NEC	National Electric Code
4.	ASME	American Society of Mechanical Engineers
5.	ASTM	American Society for Testing and Materials
6.	FIA	Factory Insurance Association
7.	IEEE	Institute of Electrical and Electronic Engineers

8.	OSHA	Occupational Safety and Health Act
9.	NEMA	National Electrical Manufacturers Association
10.	NFPA	National Fire Protection Association

1.22 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 nor 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 desired.

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. Prepare and submit for approval 3/8" scale or larger working drawings and sections, clearly showing how this work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

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. All distribution systems which require pitch or slope such as storm and sanitary drains and water piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, lights and apparatus and install work to avoid interferences.

F. 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.

G. 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.

H. The contractor shall refer to Division 01 Specification Section 01 3100 for coordination requirements. This contractor shall submit Requests for Information (RFI’s) regarding the work of this section in accordance with the provisions of Division 01.

1.23 SEISMIC RESTRAINT REQUIREMENTS

A. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements:

B. Ability to accommodate relative seismic displacements of supported item between points of support.

C. Ability to accommodate the required seismic forces.

D. For each respective set of anchor bolts provide calculations to verify adequacy to meet combined seismic-induced sheer and tension forces.

E. For each weldment between structure and item subject to seismic force, provide calculations to verify adequacy.

F. Calculations shall be stamped by a professional engineer who is registered in the Commonwealth of Massachusetts and has specific experience in seismic calculations.

G. Restraints shall maintain the restrained item in a captive position without short circuiting the vibration isolation.

H. Provide seismic restraints for all conduit and equipment in accordance with the requirements of the Massachusetts State Building Code, 780 CMR, 9th Edition, and referenced requirements of BOCA and NFPA.

1.24 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 pressure test, mechanical performance test and cooling and heating function test to determine that the system will perform according to the contract requirements. The above tests shall be witnessed by the Architect and the Owner at his option and acceptance will only be granted in writing by the Owner after receipt of certification from the Architect that the design criteria have been met. Commissioning shall be provided for fire alarm systems, lighting control systems, electrical systems including all panel boards and distribution prior to final acceptance.

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 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.

D. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section will interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. If so directed, prepare and submit for approval 3/8" scale or larger working drawings and sections, clearly showing how this work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

1.25 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 he shall replace any work which may be damaged, lost or stolen, without additional cost to the Owner.

1.26 RELATED WORK IN OTHER SECTIONS

A. The following work is not included in this Section.

1. Starters will be furnished under other Sections.
2. Motors will be furnished and set in place under other Sections.
3. Structural supports necessary to distribute loading from equipment to roof to floor except as specified.
4. Temporary water, heat, gas and sanitary facilities for use during construction and testing.
5. Automatic temperature control wiring except as noted on Drawings.
6. Installation of fire protection water flow switches.
7. Staging, scaffolding, ladders, chutes and other construction aids.
8. Fire-rated enclosures around recessed fluorescent lighting fixture housings, if required.
9. Power wiring beyond supply points, control wiring and remote disconnects for burners in heating equipment.

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. 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.

C. 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.

D. Conduit shall meet NEMA requirements and shall be UL-listed as required by Article 347 of NEC.

E. Conduit, fittings and solvent cement shall be by single approved manufacturer.

1. Material shall have minimum tensile strength of 7,000 psi at 73.4 °F, minimum flexural strength of 11,000 psi, and minimum compressive strength of 8,600 psi.

F. Flexible metallic conduit shall be galvanized; spiral wrapped metallic conduit (Greenfield) or liquid-tight flexible metallic conduit as specified for specific equipment.

G. Conduit expansion fittings shall be threaded hot-dipped galvanized malleable iron with internal bonding assembly by O.Z./Gedney, or approved equal.

H. Conduit fire seal fittings shall have heat-activated intumescent material for fire rating equal to or higher than that of floor or wall by O.Z./Gedney, or approved equal.

I. Provide water-tight gland sealing assemblies with pressure bushings as required for penetrations.

J. 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, case-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. Provide diecast set screw fittings for EMT conduit.

2.2 OUTLET BOXES

A. Outlet boxes on concealed work shall be standard residential type (plastic), with plaster rings as required. Outlet boxes for exposed conduit work shall be cast aluminum alloy with cast aluminum alloy 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 residential type (plastic) with plaster rings or gang covers as required.

D. Outlet boxes shall be by Steel City Electric Company, Appleton Electric Company, 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.

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.

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. Pull boxes used with aluminum conduit shall be metal compatible with aluminum.
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. 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 wire and cable with insulation rated 600V, of sizes specified and scheduled on Drawings, by General Electric, Rome, and Okonite or approved equal, for secondary service, feeders, branch and system wiring. Wire insulated for 300V may be used where voltage is less than 100V, if isolated from higher voltages. Wire sizes shown and specified are American Wire Gauge for aluminum.

B. Metal Clad (MC) cable shall be Type AC 600V 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 #14 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 control circuits and signal wiring may be #14 if NEC requirements are met. Branch circuits longer than 75' for 120V 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. Arc-proofing

G. Provide flexible, flame-retardant, organic-composition-coated elastomer arc-proofing tape on power cable in manholes and handholes, suitable to withstand 200 A arc for 30 seconds. Tape shall be self-extinguishing and shall not support combustion.

H. Apply tape in single, half-lapped layer as required by manufacturer's recommendations. Secure with strips of red plastic film tape on 208Y/120V conductors.

I. Splices and Terminations:

1. Make splices in branch circuit wiring with UL-listed, solderless connectors rated 600V, 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 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. Connectors for cables 250 KCMIL and larger shall have two clamping elements or compression indents. Terminals for bus connections shall have two bolt holes.
4. Ampacity of splices and connectors shall be equal to those of associated wires and cables.

J. Provide three-ply marlin twine lacing or self-extinguishing nylon straps with -65 °F to 350 °F range for bundling conductors.

2.5 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 and 6" for 480 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.

D. Main buswork of panels shall carry at least full rating of feeder overcurrent device that supplies panel.

E. Panel separate equipment ground bus for each panelboard.

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. Increase size of panelboard gutters to accommodate compression connectors for aluminum conductors.

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 Eaton, GE, Siemens 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. Main bus bars shall be aluminum, sized as required by UL standards to limit temperature rise on current-carrying parts to 50oC above ambient 40oC maximum.

L. Provide 1/2" spacers for panelboards mounted at exterior walls below grade to establish 1/2" air space behind panel.

M. Provide typed panel directories that show use of each circuit and electrical characteristics of panelboard.

2.6 FEEDER IDENTIFICATION

A. Provide nonferrous identifying tags or pressure-sensitive labels for cables, feeders, and power circuits in vaults, pull boxes, manholes and switchboard rooms, at cable termination and in other locations.

B. Tags or labels shall be stamped or printed to correspond with markings on Drawings or marked so that feeder or 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.

2.7 COLOR CODING

A. Color code secondary service, feeders and branch circuit conductors as follows:

208/120 Volts	Phase
Black	A
Red	B
Blue	C
White	Neutral
Green	Ground

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, or
6. Surface printing every 12", maximum spacing of 18".

C. Branch circuit conductors #14, #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. Conductor's #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 hash 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 used for wire #10 or larger, with color code specified in Subparagraph A:

1. Apply 3/4" 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 tool or pliers, and cut off excess.

2.8 WIRE PULLING EQUIPMENT

A. Provide polyethylene ropes for pulling wire.

B. Provide fish wires in telephone conduits and other empty conduit systems required, without splices and with ample exposed lengths at each end.

C. Provide wire pulling lubricants that meet applicable UL requirements as necessary.

2.9 CABLE SUPPORTS AND BOXES

A. Provide cable supports and boxes for vertical feeders as required by NEC. Boxes shall be 10 gauge steel plates fastened to angle iron frame with removable covers secured with brass machine screws.

B. Provide split wedge cable supports with clamps for cable without metallic sheath. Provide basket weave or approved equal cable supports approved by cable manufacturer for cable with metallic sheath. Supports shall be by O.Z./Gedney, or approved equal.

2.10 WIRING DEVICES

A. Provide wiring devices by single manufacturer. Arrow-Hart (Division of Crouse-Hinds), Leviton, Bryant, Hubbell or approved equal. Catalog designations of Arrow-Hart are specified to establish standards of quality for materials and performance. Devices shall be white with matching white cover plates.

B. Toggle Switches:

1. Single-pole shall be No. 1991, 20A. 120-277 V AC.
2. Double-pole shall be No. 1992, 20A., 120-277 V AC.
3. Three-way shall be No. 1993, 20A., 120-277 V AC.
4. Four-way shall be No. 1994, 20A., 120-277 V AC.
5. Thermal Switches

C. Thermal switches shall be NEMA Type 1 toggle switch for normal duty with thermal overload relay and pilot light. Switch enclosures shall be of a type approved for the location and atmosphere in which it is mounted. Thermal switches shall be installed where required by Code.

1. Thermal switches shall be as manufactured by Square D, General Electric, I.T.E., or equal.

D. Receptacles - 20A Tamper Resistant Commercial Grade

1. Duplex receptacles shall be grounding type, rated 20 amperes, 125 volts. Receptacles shall be back and side wired with screw type terminals. Screw terminals shall be utilized. Receptacles shall have a mechanical shutter system for reliable tamper resistant design.

E. Special receptacles for single equipment, where required, shall have additional grounding leg and shall be of capacity and configuration for the equipment to be connected.

F. Receptacles - 20A GFI - Commercial Grade

1. Provide GFI duplex receptacles as indicated on the Drawings. Receptacles shall each have GFI tripping (no feed-through is permitted). Receptacles shall be rated 20 amp, 125 volt similar and be tamper resistant.

G. Weatherproof Receptacles – Damp Locations

1. Receptacles indicated to be weatherproof shall have an enclosure that is weatherproof when the receptacle is covered (attachment lug not inserted and receptacle covers closed).

H. Weatherproof Receptacles – Wet Locations

1. Receptacles indicated to be weatherproof shall conform to NEC Article 406.8(B)(i). Receptacles shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted.

2.11 WIRING DEVICE PLATES

A. Provide white plastic device plates by Pass & Seymour, Arrow-Hart, Bryant, Hubbell, or approved equal in all common areas. Verify color and type of device plate with Architect prior to purchase.

B. Communication outlet plates shall be provided by the Communications Installer.

C. Device plates shall be manufacturer of wiring devices.

D. Outlets shall be flush to surface.

2.12 SAFETY DISCONNECT SWITCHES

A. Provide quick-make/quick-break safety switches: Type HD, heavy duty, Class 3, Design 3, for elevator only. Provide general duty for all others. Provide NEMA 1 or NEMA 12 enclosure for dry applications and NEMA 3R for wet. Switches shall be rated 240 or 600V minimum 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 aluminum. 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.

2.13 LED LUMINARES AND DRIVERS

A. All Luminaires

1. Comply with IES LM-79-08 Approved Method for measuring lumen maintenance of LED light sources.
2. Comply with IES LM-80-08 Approved Method for electrical and photometric measurement of SSL product.
3. LED’s shall be Restriction of Hazardous Substances Directive (RoHS) compliant.
4. LED arrays shall be sealed, high performance, long life type; minimum 70% rated output at 50,000 hours.
5. LED luminaires shall deliver a minimum of 60 lumens per watt.
6. LED’s shall be “Bin No. 1” quality
7. Drivers shall be solid state and accept 120 through 277 VAC at 60 Hz input.
8. The LED light source shall be fully dimmable with use of compatible dimmers switch designated for low voltage loads.
9. LED color temperatures: CRI> 85, 2700K as noted +/- 145K.
10. LED color temperatures: CRI> 85, 3000K as noted +/- 275K.
11. Luminaires shall have internal thermal protection.
12. Luminaires shall not draw power in the off state. Luminaires with integral occupancy, motion, photo-controls, or individually addressable luminaires with external control and intelligence are exempt from this requirement. The power draw for such luminaires shall not exceed 0.5 watts when in the off state.
13. Color spatial uniformity shall be within .004 of CIE 1976 diagram.
14. Color maintenance over rated life shall be within .007 of CIE 1976.

15. Indoor luminaires shall have a minimum CRI of 85.
16. Luminaire manufacturers shall adhere to device manufacturer guidelines, certification programs, and test procedures for thermal management
17. LED package(s)/module(s)/array(s) used in qualified luminaires shall deliver a minimum 70% of initial lumens, when installed, for a minimum of 50,000 hours.
18. Luminaires shall be fully accessible from below ceiling plane for changing drivers, power supplies and arrays.

B. Power Supplies and Drivers

1. Power Factor: 0.90 or higher
2. Maximum driver case temperature not to exceed driver manufacturer recommended operation.
3. Output operating frequency: 60Hz.
4. Interference: EMI and RFI compliant with FCC 47 CFR Part 15.
5. Total Harmonic Distortion Rating: 20% Maximum.
6. Meet electrical and thermal conditions as described in LM-80 Section 5.0.
7. Primary Current: Confirm primary current with Drawings.
8. Secondary Current: Confirm secondary current specified by individual luminaire manufacturers.
9. Compatibility: Certified by manufacturer for use with individually specified luminaire and individually specified control components.
10. Solid-state control components to be integral or external per each specified luminaire. Remote control gear to be enclosed in Class 1, Class 2, or NEMA 3R enclosures as required.

2.14 LIGHTING FIXTURES

A. 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.

B. Verify ceiling constructions, and provide fixtures, ballasts, frames, rings and other accessories suitable for construction encountered.

C. Coordinate installation of fixtures with installation of ceiling materials and suspension system.

1. Ceiling-mounted fixtures shall be supported independent of hung ceiling with threaded rod or bow chain.
2. In no case shall lighting fixtures be suspended from hung ceiling, conduit or duct. Fixtures shall be supported from structural members only.
3. Provide unistruct below ducts from which to hang fixtures when fixture locations coincide with duct runs. Provide threaded rods to support unistrut.
4. Investigate lighting fixture locations and supports to ensure that no interference exists between lighting fixture, supports and other equipment. Correct interferences as directed by Architect.

D. Refer to fixture schedule for specific lamp requirements.

2.15 ADDRESSABLE FIRE DETECTION AND ALARM SYSTEM

A. General

1. The contractor shall modify the existing fire alarm system to accommodate new devices.
2. At no time shall be building be without proper fire alarm coverage.
3. Any and all fire alarm cable splicing is allowed in accordance with code requirements in a listed enclosure [NEC 760.30 (B)]
4. The existing fire alarm system control panel is manufactured by Simplex and is a Simplex Panel #4010.
5. All components and wiring added to the system shall be compatible with the existing system.
6. Equipment shall be UL listed or approved and shall meet approval of local fire department and state fire marshall, authorities having jurisdiction and shall be in accordance with the applicable sections of the latest edition of the Massachusetts Electrical Code, ADA Code, NFPA 71, 72, 72E, and Life Safety Code #101.
7. Each remote device shall have a unique code. All remote devices shall be under the control of the main system microprocessor.
8. The Contractor shall be responsible for all fire alarm testing, reprogramming and certification charges.

B. Operation

1. Refer to dwgs for Sequence of Operations Matrix

C. Remote Devices

1. Smoke detectors shall be addressable solid state, photoelectric type with 3.0% nominal sensitivity. Smoke detectors shall be a plug-in unit which mounts to a twistlock base.
2. Heat detectors shall be addressable, low-profile, matte white, rated 135ºF fixed temperature as shown on the Drawings.
3. Horn strobe units shall be installed flush-mounted. The visual strobe shall meet all requirements of the ADA Code. Strobe shall be rated as follows:

    a. The lamp shall be a xenon strobe type or equivalent.
    b. The color shall be clear or nominal white, i.e., non-filtered, or clear filtered white light.
    c. The maximum pulse duration shall be two-tenths of one second (0.2 second) with a maximum duty cycle of 40 percent. The pulse duration is defined as the time interval between initial and final points of 10 percent of maximum signal
    d. The intensity shall be a minimum of 75 candela
    e. The flash rate shall be a minimum of 1 Hz and a maximum of 3 Hz.
    f. Horn strobe units shall flash synchronously with other horn strobes and other strobe only devices in the same zone. System shall hold synchronization for a minimum of 15 minutes.
    g. The audible portion of the device shall be rated to meet ADA Codes and shall meet the following criterion:

        1) The speakers shall produce a sound that exceeds the prevailing equivalent sound level in the room or space by at least 15 dba or exceeds any maximum sound level with a duration of 60 seconds, by 5 dba, whichever is louder. Sound levels for alarms shall not exceed 120 dba.

2) No place in common corridors or hallways in which visual alarm signaling appliances are required shall be more than 50 feet from the signal. In corridors, visible notification appliances shall be provided not more than 15 feet from the end with a separation not greater than 100 feet per NFPA 7.5.4.2.5.

D. Wiring and Conduit

1. All fire alarm wire and cable shall be UL listed for fire alarm use.
2. The electrical contractor shall coordinate the installation of the fire alarm equipment with the manufacturer. All conductors and wiring shall be installed per the manufacturers' recommendations.
3. The fire alarm system wiring shall be Class "A" with end-of-line resistors located in the FACP. Both alarm initiating circuits and communications loop circuits shall be Class "A" type.
4. For fire alarm wiring in concealed areas, fire alarm cable shall be plenum rated type FPLP, with red outer jacket. Installation shall meet requirements of NEC Article 770 and 725. Conductors shall be solid copper #14 minimum, with low-smoke, low-flame type jacket.
5. For fire alarm wiring in exposed areas, fire alarm wiring shall be type THHN insulation. Wire size shall be #14 AWG minimum. All wiring related to the fire alarm system shall be installed in type EMT conduit.
6. All junction boxes shall be sprayed red and labeled "fire alarm".

E. Programming

1. The existing system shall be field programmed for all new added devices.
2. A hard copy of the final system configuration showing all inputs, outputs, descriptions, addresses, and programming matrixes shall be provided at final acceptance test.

F. Shop Drawings

1. Shop Drawings shall include both equipment catalog cuts (product data sheets) and one-line riser/interconnect diagrams.
2. Provide battery calculations showing 20% spare capability.
3. Catalog cuts shall indicate descriptive information and technical data and shall be supplied for all equipment including main fire alarm control panel and all remote devices.
4. One-line riser or interconnect drawing shall be supplied on 24"x36" size drawing. All fire alarm devices, power supplies, splice cabinets, and transmitting equipment shall be shown with interconnect wire size.

G. Warranty

1. Warrant all equipment and wiring free from mechanical and electrical defects for one year from the date of substantial completion.

H. Testing

1. The Electrical Contractor shall be responsible for all required fire alarm testing.
2. Prior to formal Fire Department Test, the Contractor shall conduct a preliminary test. The Electrical Contractor and the equipment manufacturer shall completely

test the system. The Manufacturer shall issue a letter of acceptability stating that all system components are installed and all remote devices are functioning.

3. After letter of acceptability has been received for the preliminary test, the Electrical Contractor shall conduct the acceptance test, as many times as required. The Electrical Contractor, Equipment Manufacturers Representative, Owner's Representative, Fire Department Representative and Service Company Representative shall conduct the acceptance test in accordance with NFPA 72. Every building fire alarm device shall be tested to ensure proper operation and correct annunciation at the control panel. At least one half of all tests shall be performed on battery standby power.
4. Where application of heat would destroy any detector, it may be manually activated.
5. When the testing has been completed to the satisfaction of both the Contractor's Job Foreman and the Representatives of the Manufacturer and Owner, the electrician shall provide a completed Inspection and Testing Form per NFPA 72, Section 10.6.2.3.
6. The Contractor shall leave the fire alarm system in proper working order and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the awarding authority.

2.16 EMPTY CONDUIT FOR LOW VOLTAGE SYSTEMS

A. For CATV, telephone and data devices, provide access for low voltage systems to be installed by others and provide the following:

1. Provide a single gang back box
2. ¾" conduit to above the accessible ceiling

B. Nylon pull strings shall be installed in all empty conduits in excess of ten feet long securely tie pull string at each end

C. All conduit shall be concealed unless noted otherwise,

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 times. 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 so that completed installation shall operate safely and efficiently.

3.2 CONTINUITY OF SERVICES

A. Do not interrupt existing services without Owner and Architect's approvals.

3.3 SPECIAL RESPONSIBILITIES

A. Coordinate work of this Section with work of other Sections.

B. Provide information about items furnished under this Section to be installed under other Sections, as necessary.

C. Obtain detailed information from manufacturers of equipment provided under this Section as to proper methods of installation.

D. Obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or by Owner.

E. 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.

F. Coordinate installation and pay backcharges to local and city building departments.

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. 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 distribution systems as necessary. Test secondary voltages under no-load and full-load conditions.

D. Test lighting fixtures with specified lamps in place for 10 hours; check fixtures in sections. Do not operate lamps other than for testing before final inspection by Architect.

E. Provide necessary testing equipment and testing.

F. Failure or defects in workmanship or materials revealed by tests or inspection shall be corrected promptly and retested. Replace defective material.

G. Clean panels, generator and other equipment. Panelboard interiors shall be cleaned and vacuumed. Equipment with damage to painted finish shall be repaired to Architect’s satisfaction.

H. Equipment: After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.5 NAMEPLATES

A. Provide nameplates in or on switchboards, panelboards, junction boxes and cabinets, and for special purpose switches, motor disconnect switches, remote control stations, starters or other controls furnished or installed under this Section. Nameplates shall designate equipment controlled and function. Load Centers do not need nameplates.

B. Nameplates shall be laminated black bakelite with 1/4" high white recessed letters. Nameplates shall be securely attached to the equipment with galvanized screws. Adhesives or cements may be used.

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.

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 cabinets, 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 buses 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 may 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. Rigid non-metallic conduit as specified in Part 2 of this Section may be used, if approved by local authorities, for installation in concrete slabs when installed as required by NEC and manufacturer's requirements. Penetrations from concrete slabs shall be made with rigid steel conduit and rigid steel conduit fittings or PVC fittings.

I. Maximum outside diameters of raceways in conduit shall be 1/3 slab thickness. No more than two 3/4" raceways shall cross in floor slab at a single point. Submit raceway crossing locations for approval before pouring slabs and relocate at no expense to Owner as directed by Architect. Lateral spacing of parallel raceways shall be at least 6" on centers. Do not run conduit in slab less than 3" thick without express approval and direction of Architect.

J. Raceways with outside diameters larger than 1/3 slab thickness shall be run concealed in hung ceilings in finished areas, exposed in unfinished Mechanical/Electrical and storage areas, below slabs on grade.

K. Penetrate waterproof walls of structural slabs and foundation walls only where approved by Architect. Submit proposed penetration points, size openings and penetration methods to Architect for approval.

L. Provide flexible conduits for connections to electrical equipment and to equipment furnished under Divisions 14 and 23 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 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.

M. 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.

N. 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 250V. 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.

O. 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”.

P. 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.

Q. 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.

R. Install conduit systems complete before drawing in conductors. Blow through and swab after plaster is finished and dry, and before conductors are installed.

S. 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.

T. Provide separate external aluminum bonding jumper secured with grounding straps on each end of fitting.

U. Conduits buried in concrete shall cross building expansion joints at right angles; provide expansion fittings as required by manufacturer's instructions. Provide insulated bushings at ends of conduits.

V. 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.

W. Install and seal fittings as required by manufacturer's recommendations. In concealed work, install fittings in flush steel box with blank cover plate.

X. Install sealing fittings at following points, and elsewhere as shown:

1. Where conduits enter or leave hazardous areas equipped with explosion-proof lighting fixtures, switches, receptacles and other electrical devices.
2. Where required by NEC.

Y. Secure conduit system as required by NEC.

Z. Attach pull ropes to conductors with basket-weave grips on pulling eyes. Pull cables that share conduit at same time

AA. 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 chain 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. Where air is supplied or returned through luminaries, coordinate compatibility of fixtures with air boots and attachments.

I. Support surface-mounted luminaries at least two concealed points to prevent rotation.

J. Fire-rated enclosures necessary for fixture housings above ceiling will be provided under another Section.

K. Mounting height of suspended or wall-mounted luminaries shall be shown on Drawings.

L. Locate ceiling-mounted fixtures as shown on reflected ceiling plans. Locate wall- and floor-mounted fixtures as shown on Electrical Drawings.

M. Coordinate aiming of adjustable fixtures with Architect.

N. Provide fire rated devices boxes where fixtures are installed in fire rated assemblies.

3.8 GROUNDING

A. Provide equipment grounding system as shown on Drawings. Equipment grounding system shall be designed 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 of 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 devices 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.

F. Provide green insulated grounding conductor in nonmetallic conduits or ducts unless specified otherwise.

END OF SECTION 26 00 00

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SECTION 32 1400
UNIT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
   1. 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) Masonry pavers at the front walk.
         2) Edge pavers at the front walk.
      b. Items To Be Installed Only: Not Applicable.
      c. Items To Be Furnished Only: Not Applicable.
      d. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
         1) Division 31 and Civil Drawings for earthwork.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. For the following:
      a. Pavers.
      b. Edge restraints.
      c. Granite curbs.
B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C136.
C. Samples for Verification: For full-size units of each type of unit paver indicated. Include Samples of the following:
   2. Joint materials.
   3. Exposed edge restraints.
   4. Granite curbs.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Adhesion and Compatibility Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.
C. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.
D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.
   5. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C67.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified unit paving installer. Installer's personnel assigned to the Work shall have Concrete Paver Installer Certification from the Interlocking Concrete Pavement Institute (ICPI) with the following designations:
   6. Commercial Paver Technician Designation.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Submit to latex-additive manufacturer, for testing as indicated below, Samples of flooring materials that will contact or affect mortar and grout that contain latex additives.

7. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimal adhesion with, and will be nonstaining to, installed brick and other materials constituting brick flooring installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquids in tightly closed containers protected from freezing.

E. Store asphalt cement and other bituminous materials in tightly closed containers.

1.7 FIELD CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Bituminous Setting Bed:

8. Install bituminous setting bed only when ambient temperature is above 40 deg F and when base is dry.

9. Apply asphalt adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when setting bed is wet or contains excess moisture.

C. Weather Limitations for Mortar and Grout:

10. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

11. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.

a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 BRICK PAVERS

A. Brick Pavers, Light-Traffic Paving Brick: ASTM C902, Class SX , Type I , Application PS . Provide brick without frogs or cores in surfaces exposed to view in the completed Work.

12. Thickness: As indicated .

13. Face Size: 4 by 8 inches .

14. Color: As selected by Architect from manufacturer's full range .

B. Efflorescence: Brick shall be rated "not effloresced" when tested according to ASTM C67.

C. Temporary Protective Coating: Precoat exposed surfaces of brick pavers with a continuous film of a temporary protective coating that is compatible with brick, mortar, and grout products and can be removed without damaging grout or brick. Do not coat unexposed brick surfaces; handle brick to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

2.3 CURBS AND EDGE RESTRAINTS

A. Granite Curbs: Granite curbing, with face battered 1 inch per foot, produced in random lengths not less than 36 inches from granite complying with ASTM C615/C615M.
   15. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Granicor, Inc.
      b. New England Stone, LLC.
      c. Polycor Inc.
   16. Granite Color and Grain: Light gray with fine grain.
   17. Top Width: 6 inches.
   18. Face Height: 4 inches.
   19. Total Height: 18 inches.

2.4 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with ASTM D448 for Size No. 57 requirements in Section 31 2000 "Earth Moving" for subbase material.
B. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D448 for Size No. 8 requirements in Section 31 2000 "Earth Moving" for base course.
C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C33/C33M for fine aggregate.
D. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D448 for Size No. 10.
E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.
   20. Provide sand of color needed to produce required joint color.
F. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.
C. Proof-roll prepared subgrade according to requirements in Section 31 2000 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
    21. For concrete pavers, a block splitter may be used.
D. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.
E. Joint Pattern: As indicated.
F. Tolerances:
    22. Do not exceed 1/16-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches and 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.
G. Expansion and Control Joints:
    23. Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 07 9200 "Joint Sealants."
    24. Provide cork joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.
H. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.4 AGGREGATE SETTING-BED APPLICATIONS

A. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.
B. Treat leveling course with herbicide to inhibit growth of grass and weeds.
C. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.
    25. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
D. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.
E. Do not allow traffic on installed pavers until sand has been vibrated into joints.
F. Repeat joint-filling process 30 days later.

3.5 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.
    26. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.
    27. Do not allow protective coating to enter floor drains. Trap, collect, and remove coating material.

END OF SECTION